124017

2010 Data Summary Report

July 2011

Grasse River Study Area
Massena, New York

Alcoa Inc.
Massena, New York

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EXECUTIVE SUMMARY

The Supplemental Remedial Studies (SRS) program was initiated in 1995 to provide information to support the identification and evaluation of potential remedial alternatives for the lower Grasse River. Initially the program was designed to obtain information pertinent to polychlorinated biphenyl (PCB) sources and fate and transport mechanisms and document spatial and seasonal variations in PCB levels in the water column and fish. Over the past several years the program has focused on the continued monitoring of long-term trends in water column and fish tissue PCB levels, as well as the annual documentation of ice formation and breakup on the river. This report details the field sampling activities and data collected from the Grasse River Study Area during the 2010 field sampling season. The major conclusions from the 2010 monitoring season are summarized below. Sampling activities and data collected as part of the 2010 Near Shore Sampling Program are presented in a separate submittal (Alcoa, March 2011).

Water column monitoring in 2010 consisted of the collection of water samples from four locations throughout the river every three weeks between April and October. Total suspended solids (TSS) and PCB data collected in 2010 are consistent with data collected over the past several years. During periods when the river is not stratified, total PCB levels generally increase with distance downstream. During periods when the river is stratified, this pattern is interrupted by a downward trend in PCB concentration that is the result of dilution of the Grasse River water with water from the St. Lawrence River. Overall, average PCB concentrations and fluxes in 2010 are similar to or lower than levels measured over the past few years (i.e., since the 2005 Remedial Options Pilot Study [ROPS]). TSS levels measured throughout the lower river were low with a maximum of 6.6 milligrams per liter (mg/L), relative to recent years with maximum TSS levels ranging from approximately 20 to 40 mg/L.

Resident fish monitoring was conducted in fall 2010 and consisted of the collection of adult smallmouth bass, adult brown bullhead, and young-of-year (YOY) spottail shiner from the Study Area. Average lipid-based PCB concentrations measured in 2010 exhibit a continued long-term decline in PCB levels since the early to mid-1990s. Since the early to mid-1990s, average lipid-based PCBs measured in smallmouth bass and brown bullhead have declined by

89% to 91% and 77% to 90%, respectively. For YOY spottail shiner, average lipid-based PCBs have declined by 77% to 81% in the lower river and about 36% at the river mouth since 1999. Average wet-weight and lipid-based PCB levels in YOY spottail shiner collected in 2010 near the Unnamed Tributary are the lowest on record.

Field reconnaissance of fish advisory signs was also conducted as part of the 2010 SRS program. On June 6, field crews reported that all but one of the fishing advisory signs were visible from shore and the majority of them were in good condition. Sign 13, located near the river mouth, appeared to have fallen and, therefore, required reinstallation.

Monitoring of river ice formation and breakup during the 2010 to 2011 winter included the review of climatological conditions, river stage and flow monitoring, ice thickness measurements and numerical simulations, and a summary of field observations and photo documentation. The lower Grasse River was fully covered with ice by December 10, 2010, and consistent ice cover remained through early-to-mid March 2011, at which time the river experienced a gradual melt-out. The official ice out date was determined to be March 22, 2011. Field crews did not observe movement of ice floes from the upper river into the lower river during the thermal melt-out period. Based on the visual observations and supporting data on stage height, river flow, air temperature, precipitation and ice thickness measurements, the March 2011 breakup was characterized as a thermal melt-out that did not create ice jam conditions in the lower Grasse River.

SECTION 1
INTRODUCTION

The Study Area is located along the northern boundary of New York (NY) State in the town and village of Massena, and encompasses approximately 8.5 miles of the Grasse River from Massena (just downstream of the Route 37 Bridge) to the confluence of the St. Lawrence River (**Figure 1-1**). The Study Area also includes Robinson Creek (which discharges to the St. Lawrence River) and the Massena Power Canal (which extends from the Massena Intake Dam located on the St. Lawrence River to the former Massena Power Dam). Monitoring and sampling activities were performed throughout the Study Area (except Robinson Creek).

The 2010 sampling program included the following activities:

<u>2010 Supplemental Remedial Studies (SRS) Program</u>

- routine water column monitoring;
- resident fish trend monitoring; and
- field reconnaissance of fish advisory signs.

<u>2010/2011 River Ice Monitoring</u>

- climatological monitoring;
- river stage monitoring;
- river ice formation monitoring; and
- ice thickness monitoring and predictive modeling.

A comprehensive sampling effort was also conducted for the near shore areas of the river in 2010; these activities and associated results are summarized in the Near Shore Sampling Program Report (Alcoa, March 2011). The field sampling activities included as part of the 2010 SRS program were conducted consistent with those performed in 2008 and 2009 in accordance with the *2008 Routine Monitoring Activities Correspondence* (as defined in the *2008 Data Summary Report;* Alcoa, June 2009) and the procedures identified in the *2005 Monitoring Work Plan* (Alcoa, March 2005). Field activities related to river ice monitoring were conducted in accordance with the modified monitoring program presented and discussed at the United States Environmental Protection Agency (USEPA) Technical Team meeting on December 18, 2008 and approved by USEPA in an email dated January 19, 2009. **Table 1-1** provides a summary of each sampling event conducted and the total number of samples collected as a result of each activity.

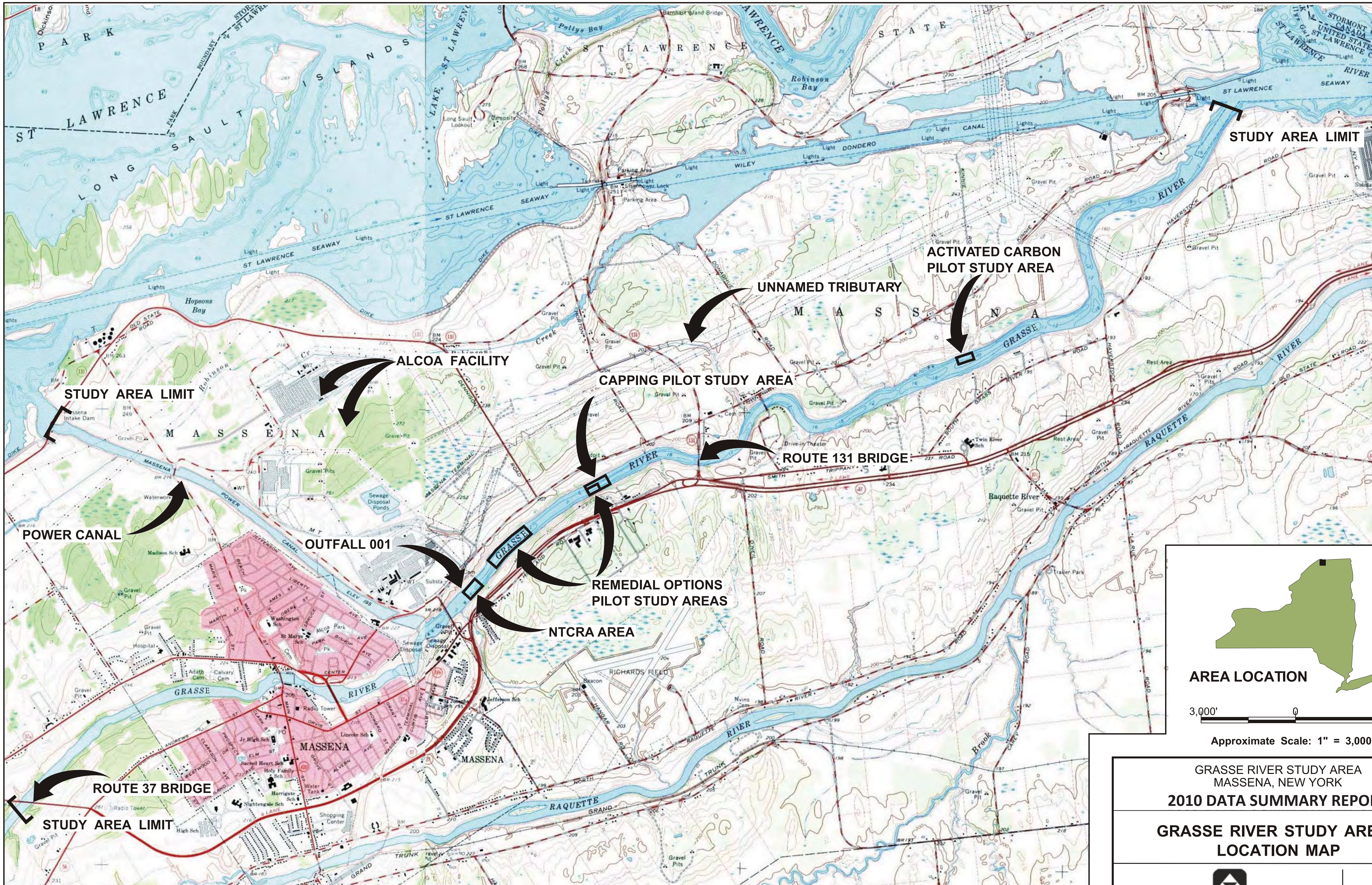
Sample collection summaries and results for the SRS Program and river ice monitoring are provided in Sections 2 and 3, respectively. Section 4 presents a review of the quality assurance/quality control (QA/QC) samples collected and analyzed as part of the above studies. In addition to the main body of this report, two appendices are included. The electronic project database containing field-derived data from the 2010 sampling programs discussed in this report, as well as data collected historically from the river, is included in both Microsoft Access and USEPA Region 2 Electronic Data Deliverable (EDD) formats in **Appendix A**. **Appendix B** contains the spring 2011 ice monitoring photos and aerial inspection.

Table 1-1.
2010 Data Collection Summary

2010 Data Summary Report
Grasse River Study Area, Massena, New York

Program	Activity	Number of Sampling Events	Number of Field Samples[1]	Laboratory Analyses
2010 SRS	Routine Water Column	9	59, 63 [2]	PCB, TSS
	Resident Fish	1	144	PCB, Percent Lipid
	Fish Advisory Signs	1	N/A	Visual Observation Only
2010/2011 Ice Monitoring	Ice	1	N/A	Visual Observation Only

Notes:
1. Counts do not include QA/QC samples. Counts do not include multiple samples to be analyzed for various parameters from the same location/sample submitted to the same laboratory.
2. Four samples could not be analyzed for PCB due to a shipping error which caused an exceedance in cooler temperature.
3. N/A - Not Applicable; PCB - polychlorinated biphenyls; TSS - total suspended solids; SRS - Supplemental Remedial Studies; QA/QC - Quality Assurance/Quality Control
4. Two additional sampling programs were conducted in 2010 and are summarized elsewhere:
   - river ice monitoring over winter 2009/2010 (Alcoa, July 2010)
   - Near Shore Sampling (Alcoa, March 2010)



GRASSE RIVER STUDY AREA
MASSENA, NEW YORK

2010 DATA SUMMARY REPORT

GRASSE RIVER STUDY AREA - LOCATION MAP

ALCOA

FIGURE
1-1

02/24/09 SYRACUSE, NY-ENV/CAD-DJH
B0010847/0000/00003/CDR/10847N01.CDR

REFERENCE: MASSENA, NEW YORK-ONTARIO USGS QUAD. 1964 RAQUETTE RIVER, NEW YORK-ONTARIO USGS QUAD. 1964

SECTION 2
2010 SRS PROGRAM

2.1 ROUTINE WATER COLUMN MONITORING

2.1.1 Monitoring Activities

Routine water column monitoring was performed every three weeks between April and October 2010 (for a total of 9 sampling rounds) to continue the ongoing monitoring of PCB concentrations in the water column and document variations associated with location, season, flow, temperature, and other variables. Water column samples were routinely collected from four locations (**Figure 2-1**) – Main Street Bridge in Massena (WCMSB); Route 131 Bridge (water column transect [WC] 131); WC011; and WC013. Samples were collected from these four locations on the dates provided below.

- Round 1: April 29, 2010
- Round 2: May 19, 2010
- Round 3: June 10, 2010
- Round 4: June 30, 2010
- Round 5: July 21, 2010
- Round 6: August 12, 2010
- Round 7: September 2, 2010
- Round 8: September 21, 2010
- Round 9: October 13, 2010

During each event, samples were collected at each location using a stainless steel Kemmerer water sampler. At WC131, WC011, and WC013 one sample was collected mid-channel from each location at 0.2 and 0.8 times the total water column depth (i.e., total of two samples per location). Due to shallow water depths at WCMSB, one sample was collected at 0.5 times the total water column depth. Sampling was performed via boat at all locations except WCMSB, where samples were collected just downstream of the Main Street Bridge from the north shore as water depths and access limitations precluded collection with a boat.

Prior to the collection of samples at each location, the total water column depth was recorded and specific conductivity and water temperature measurements were obtained every two feet (ft.) in the water column (at mid-channel) to check for the presence of stratification. Field water quality measurements of specific conductivity, water temperature, pH, turbidity, and dissolved oxygen (DO) were also collected at 0.2 and 0.8 times the total water column depth (at mid-channel) at WC131, WC011, and WC013. Similarly, these field parameters were collected at WCMSB from the north shore just downstream of the bridge at 0.5 times the total water column depth.

All monitoring activities were conducted consistent with those performed in 2008 and 2009 in accordance with the *2008 Routine Monitoring Activities Correspondence* and the procedures identified in the *2005 Monitoring Work Plan* (Alcoa, March 2005). Additional pertinent information relative to field activities for each sampling round and any necessary variations to the sampling protocol described in the *2005 Monitoring Work Plan* (Alcoa, March 2005) are provided in **Table 2-1**.

A total of 63 water samples (not including QA/QC samples) were packaged and submitted to Northeast Analytical, Inc. (NEA), a division of Pace Analytical Services (hereinafter referred to as NEA) in Schenectady, NY consistent with the methodologies outlined in the *2005 Monitoring Work Plan* (Alcoa, March 2005). Water column samples were analyzed for PCB congeners and total suspended solids (TSS). QA/QC sampling included the collection of an equipment rinse blank before and after each sampling round, and one duplicate and one matrix spike/matrix spike duplicate (MS/MSD) each round. The equipment rinse blank and MS/MSD samples were analyzed for PCB congeners, and the duplicate samples were analyzed for PCB congeners and TSS. As described in **Table 2-1**, sample cooler delivery was delayed on two different occasions (Rounds 1 and 5), resulting in cooler temperatures significantly above the required 4 degrees Celsius (°C). Therefore, PCB and MS/MSD samples from these rounds were not analyzed. Additional duplicate and MS/MSD samples were collected during the subsequent round for PCB analysis to fulfill QA/QC requirements. Shipping was performed using a courier following the Round 5 delivery delay to avoid future issues. A total of 59 samples were analyzed for PCB congeners and 63 samples for TSS (not including QA/QC samples). Details on the results of the QA/QC sampling are presented in Section 5.

2.1.2 Summary of Results

Routine water column monitoring data from 2010 can be found on the attached CD-ROM (**Appendix A**) in the Access and EQuIS data tables entitled climate, riverflow_ChaseMills, riverflow_hist, riverflow_tapedown, water_field, and water_iupac. PCB and TSS results for 2010 are also summarized in **Tables 2-2** and **2-3**.

2.1.2.1 River Flow and Precipitation

Daily flow and precipitation data measured in 2010 are shown in **Figure 2-2**. The 2010 annual average flow estimated from 15-minute provisional flow records from the United States Geological Survey (USGS) gage on the Grasse River at Chase Mills was approximately 1,284 cubic feet per second (cfs), slightly higher than the historic long-term average Grasse River flow of 1,100 cfs (Alcoa, April 2001). At the Chase Mills gage, the spring-time peak daily average flow of 3,801 cfs was observed in late March, and was within the range of typical spring flows for the lower Grasse River (Alcoa, April 2001). Flows decreased during the late spring and summer months (i.e., April through September), with an average flow of 685 cfs. The highest flow of 8,243 cfs was recorded on October 2 and was the result of significant precipitation events that were experienced in late September.

Total precipitation measured near Outfall 007 during 2010 was approximately 37 inches (in.), which is higher than the total precipitation in 2008 (30 in.) and the long-term average annual of 30 in. The maximum daily precipitation measurement of 2.4 in. occurred on August 3, 2010.

2.1.2.2 Water Quality

Stratification occurs in the lower Grasse River when colder water with higher specific conductivity (relative to the Grasse River water) from the St. Lawrence River enters into and moves upstream along the bottom of the lower Grasse River. Based on previous evaluations, differences of about 3 to 5°C in water temperature and about 20 micro Siemens per centimeter (µS/cm) in specific conductivity between the two water masses (i.e., 0.2 and 0.8 times the total water column depths) were used to identify the existence of stratification (**Figure 2-3**). Water temperature data showed the river was stratified at WC013 from late-April to mid-June and again in July and September. Stratification was not observed during sampling at upstream locations. Similar patterns were generally observed in the specific conductivity data as well.

TSS levels measured throughout the river were generally low (**Figures 2-4a** and **b**). At WCMSB, the average TSS concentration was 2.3 milligrams per liter (mg/L). Average TSS levels in the lower river were similar, ranging from an average of 2.6 mg/L at WC013 to 3.1 mg/L at WC131. The highest TSS concentration of 6.6 mg/L was observed at WCMSB on June 30, 2010 (at an estimated flow of about 1,397 cfs).

2.1.2.3 PCBs

During analysis at the laboratory, one river sample collected during Round 4 (WC013-4 [0.8]) was contaminated by laboratory spiked samples processed directly before it. Although this Round 4 sample was not flagged by the laboratory, PCB congener patterns resemble those of the spiked QA/QC samples and are not consistent with other field samples collected during this round (which were analyzed prior to the laboratory spikes). As a result, PCB congener data for this sample have been excluded from the discussion below, as well as associated tables and figures, and flagged in the water_iupac table of the database. Also, three river samples collected during Round 1 sampling (WC013-1[0.2], WC013-1[0.8], and WCMSB-1[0.5]) and three samples collected during Round 5 sampling (WC131-5[0.2], WC011-5[0.2], and the duplicate) were not be analyzed for PCBs due to elevated temperatures in the cooler measured upon arrival at the laboratory (see Section 2.1.1).

PCB concentrations measured at the Main Street Bridge were below detectable limits during all rounds in 2010. At the lower river locations, PCB concentrations were typically low, measuring below 25 nanograms per liter (ng/L) throughout the year (**Figure 2-5**). As in past years, PCB concentrations in the spring/summer were higher than those in the fall. PCB mass flux (i.e., the product of PCB concentration and river flow) was calculated to account for seasonal differences in river flow. Average PCB mass flux was highest in the spring (i.e., April), slightly lower in the summer months (i.e., June, July, and August), and lowest in the fall (i.e., September and October) (**Figure 2-6**)

Water column PCB levels vary spatially in the lower Grasse River (**Figures 2-7a** and **b**). During non-stratified periods (e.g., April, May, late September, and October), PCB levels generally increase from upstream to downstream. During times when stratification was occurring (e.g., June through September), PCB concentrations were lowest at WCMSB (non-detect), peaked at WC131 or WC011, and declined at WC013. For example, average water column PCB concentrations on July 21 (Round 5) increased from non-detect at WCMSB (River Mile [RM] 8.0) to 16 ng/L at WC131 (RM 4.6) and 26 ng/L at WC011 (RM 3.3), then declined downstream to about 12 ng/L at WC013 (RM 0.2). The decline in PCB levels between WC011 and WC013 is attributed to the dilution of Grasse River water with St. Lawrence River water. The one exception to this is noted during Round 4 (June 30), where all field samples, except for the one from WC013 discussed above, were reported below the detection limit.

PCB composition in water samples collected at WC131 and WC011 exhibits similar seasonal patterns (**Figure 2-8**). In the spring, measured PCBs at these locations were primarily composed of di-chlorinated biphenyls (CBs; 54%) and to a lesser extent tri-CBs (29%), with some mono-CBs and tetra-CBs (both at 8%). In the summer, di-CBs still dominate the PCB signature, but the difference between the di- and tri-CBs is diminished. Tetra-CBs remain relatively similar (at about 10% to 15%), and mono-CBs are not present. In the fall, tri-CBs dominate the PCB signature, averaging about 45% to 50% of the total PCBs, with di-CBs comprising 40% to 45% of the total PCBs. Similar to spring and summer, tetra-CBs represent about 10% of the total PCBs at these locations.

The PCB composition at WC013 is slightly different than at the other lower river locations. Although the PCB signature is still dominated by di- and tri-CBs, they exhibit similar proportions throughout the year. Tetra-CBs, however, comprise a greater proportion of the total PCBs (about 15% to 20% in the summer and fall samples).

2.1.2.4 Comparison to Historic Data

In general, water column PCBs measured in 2010 were similar to or lower than those measured over the past few years and overall water column PCB concentrations have generally exhibited a decline over the period of record (i.e., 1995 to 2010; **Figures 2-9a** and **b**). These patterns also are evident in PCB mass flux (**Figures 2-10a** and **b**). For example, average summer (July and August) PCB fluxes at WC131 have declined from about 400 to 500 grams per day (g/day) in 1996 to 1998 to less than 10 g/day from 2007 through 2010. Similarly, average summer PCB fluxes at WC011 have declined from about 600 g/day to about 10 g/day over this same period (i.e., 1998 to 2010). Average flux levels measured in the summer at WC131 were the lowest on record.

Two exceptions to the general overall decline in PCBs are observed in the water column PCB data. In 2005, water column PCB concentrations and mass fluxes are elevated above typical PCB levels at all locations; these elevated PCB levels are due to the PCB releases that were documented during the 2005 Remedial Options Pilot Study (ROPS) dredging activities (Alcoa, May 2006). In spring 2009, PCB fluxes measured at the lower river locations (WC007A/WC131, WC011, and WC013) are elevated relative to those from prior years. Upon closer inspection, it was determined that the elevated spring PCB mass fluxes were due to flows in May 2009 (Round 2) that were two to four times higher than those typically encountered during prior May surveys.

In addition, the June 2009 (Round 3) water column sampling results indicated PCB levels in select water samples were unusually high in relation to typical PCB concentrations observed during past spring surveys and also high relative to other samples collected during this round.

These unusual results were attributed to laboratory contamination because the affected samples: 1) were sequenced through the laboratory gas chromatographs after the laboratory quality control samples; and 2) contained PCB concentrations and composition that were similar to those of laboratory quality control samples, which are much different than those typically found in the river. The laboratory contamination observed in 2009 was not evident in the May 2009 Round 2 samples.

2.2 RESIDENT FISH TREND MONITORING SURVEY

2.2.1 Monitoring Activities

The fall resident fish sampling was performed September 8 through 21, 2010. Activities were conducted consistent with 2008 and 2009 activities as identified in the *2008 Routine Monitoring Activities Correspondence* and the procedures identified in the *2005 Monitoring Work Plan* (Alcoa, March 2005). Sampling efforts were conducted in the Massena Power Canal, four stretches of the lower Grasse River (Background, Upper, Middle, and Lower), and at the Grasse River mouth. The resident fish species targeted during this program were adult (≥25 centimeters [cm]) smallmouth bass (*Micropterus dolomieui*), adult (≥25 cm) brown bullhead (*Ictalurus nebulosus*), and young-of-year (YOY) (<6.5 cm) spottail shiner (*Notropis hudsonius*). Fish were collected using boat-mounted electrofishing equipment. A summary of the fish targeted and captured as part of this program is provided in **Table 2-4**, and is further discussed below.

For the adult resident fish program, 17 adult smallmouth bass were collected from the Massena Power Canal, and 17 adult smallmouth bass and 18 adult brown bullhead were collected from each of the Upper, Middle, and Lower Stretches of the river. Five adult smallmouth bass and five adult brown bullhead were collected from the Background Stretch. Approximate adult smallmouth bass and brown bullhead collection locations are shown in **Figures 2-11** and **2-12**, respectively. The length and weight of each individual bass and bullhead collected are summarized in **Table 2-5**.

Three YOY spottail shiner composite samples were collected from each of four locations within the Study Area: near Outfall 001 (Upper Stretch); near the Unnamed Tributary (Middle Stretch); at the mouth of the river (downstream of the Lower Stretch); and within the Background Stretch. Each whole-body composite sample contained between 21 and 24 individual fish. The minimum and maximum length of fish in a sample and the total weight of each sample are summarized in **Table 2-6**. Approximate spottail shiner collection locations are provided in **Figure 2-13**.

In total, 144 fish samples were packaged in the field and shipped to NEA for processing and analysis of PCB Aroclors and lipids in accordance with the procedures identified in the *2005 Monitoring Work Plan* (Alcoa, March 2005). These included 73 adult smallmouth bass fillets (skin-on, scales-off), 59 adult brown bullhead fillets (skin-off), and 12 YOY spottail shiner whole-body composite samples. QA/QC samples consisted of one MS/MSD per 20 samples collected, and were prepared by the laboratory from the submitted fish samples.

2.2.2 Summary of Results

2.2.2.1 PCB Results

Resident fish data from 2010 can be found on the attached CD-ROM (**Appendix A**) in the Access and EQuIS data table entitled resfish_aro. PCB results also are listed in **Tables 2-5** and **2-6** and are discussed below by species.

Smallmouth Bass

Average PCB concentrations for smallmouth bass are shown on the two left panels in **Figure 2-14**. Average lipid-normalized PCB concentrations exhibit no consistent spatial trend, with average PCB levels of 164, 131, and 151 milligrams per kilogram (mg/kg) lipid in the Upper, Middle, and Lower Stretches, respectively. The average lipid-normalized PCB concentration in smallmouth bass from the Power Canal was 24 mg/kg lipid, which is about five to seven times lower than those from the Grasse River proper. Lipid-normalized PCB levels were below detection in the Background Stretch (due to wet weight PCB levels that were reported below the detection limit).

On a wet-weight basis, average PCB concentrations in the Upper and Lower Stretches were similar (0.9 and 0.7 mg/kg, respectively), and lower than those observed in the Middle Stretch (1.3 mg/kg lipid). PCB levels were below the detection limit (about 0.05 mg/kg) in all five samples collected from the Background Stretch. The average wet-weight PCB concentration in smallmouth bass from the Power Canal was 0.2 mg/kg.

Brown Bullhead

Average PCB concentrations for brown bullhead are shown on the two middle panels in **Figure 2-14**. Lipid-normalized PCB levels were below detection in the Background Stretch (due to wet weight PCB levels that were reported below the detection limit). Average lipid-normalized PCB levels were highest in the Upper Stretch (150 mg/kg lipid), while those in the Middle Stretch and Lower Stretch were similar (93 and 111 mg/kg lipid, respectively). Statistical differences were not observed between the lower river sampling locations.

On a wet-weight basis, average PCB concentrations in the Upper, Middle and Lower Stretches were similar (1.3, 1.3, and 1.9 mg/kg, respectively). PCB levels in brown bullhead samples were below the detection limit (about 0.05 mg/kg) in the Background Stretch.

YOY Spottail Shiner

Average PCB concentrations for YOY spottail shiner are shown on the two right panels in **Figure 2-14**. Average lipid-normalized PCB levels near Outfall 001 and the Unnamed Tributary were similar (35 and 31 mg/kg lipid, respectively) and higher than those measured at the River Mouth (16 mg/kg lipid). PCB levels were lowest in the Background Stretch, with an average of 0.7 mg/kg lipid.

Average wet-weight PCB concentrations in YOY spottail shiner exhibited a similar pattern to those observed in the lipid-normalized PCBs; levels near Outfall 001 and the Unnamed Tributary were similar (2.3 and 2.0 mg/kg, respectively) and lower at the River Mouth (0.7 mg/kg). Concentrations were below the detection limit in two of the three samples collected from the Background Stretch; the third sample contained a PCB level of 0.1 mg/kg.

2.2.2.2 Comparison to Historic Data

Historic data for smallmouth bass are presented in **Figures 2-15** and **2-16**. Lipid-based PCB levels in 2010 are similar to or less than those measured over the past several years. In all locations, including the Power Canal (**Figure 2-16**), average lipid-based PCB levels are within the lower range of historic levels. Overall, average lipid-based PCBs measured in smallmouth bass from the Upper Stretch have declined from about 1,470 mg/kg lipid during the mid-1990s to about 164 mg/kg lipid in 2010, representing an 89% decline over this period. Similarly, average lipid-based PCBs in smallmouth bass have declined from about 1,540 mg/kg lipid to about 131 mg/kg lipid in the Middle Stretch (representing an 91% decline) and about 1,350 mg/kg lipid to about 151 mg/kg lipid in the Lower Stretch (representing an 89% decline) over this same period (i.e., 1993 to 2010). Similar patterns were observed in PCB concentration on a wet-weight basis.

Historic data for brown bullhead are shown in **Figure 2-17**. Overall, average lipid-based PCBs in brown bullhead from the Upper Stretch have declined from about 660 mg/kg lipid during the early to mid-1990s to about 150 mg/kg lipid in 2010, representing a 77% decline over this period. Similarly, average lipid-based PCBs in brown bullhead have declined from about 890 mg/kg lipid to about 93 mg/kg lipid in the Middle Stretch (representing an 90% decline) and from about 820 mg/kg lipid to about 111 mg/kg lipid in the Lower Stretch (representing an 86% decline) over this same period (i.e., 1993 to 2010). Similar patterns were observed in PCB concentration on a wet-weight basis.

Historic data for YOY spottail shiner are presented in **Figure 2-18**.[1] Average wet-weight and lipid-based PCB levels near the River Mouth are similar to, or slightly lower than, levels measured in 2008, and are within the lower range of historic levels. Average lipid-based PCB levels near Outfall 001 and the Unnamed Tributary are the lowest on record (35 and 31 mg/kg lipid, respectively; 1998 to 2010). Similar patterns were observed in PCB concentration on a wet-weight basis.

Overall, average lipid-based PCBs in spottail shiner from near Outfall 001 have declined from about 150 mg/kg lipid in 1999 to about 35 mg/kg lipid in 2010, representing a 77% decline over this period. Similarly, average lipid-based PCBs in spottail shiner have declined from about 165 mg/kg lipid to 31 mg/kg lipid near the Unnamed Tributary (representing an 81% decline) and from about 36 mg/kg lipid to about 16 mg/kg lipid near the River Mouth (representing an 56% decline) over this same period (i.e., 1999 to 2010).

2.3 FIELD RECONNAISSANCE OF FISH ADVISORY SIGNS

2.3.1 Monitoring Activities

Thirteen fishing advisory signs were installed along the banks of the lower Grasse River in 2005. As requested by the USEPA and the New York State Department of Health (NYSDOH), annual field reconnaissance of these signs is conducted as part of the SRS Program to confirm the signs are in place and visible to the public. The 2010 field reconnaissance event was conducted on June 6, 2010 with activities performed in accordance with the *2008 Routine Monitoring Activities Correspondence* and the *2005 Monitoring Work Plan* (Alcoa, March 2005). The locations of the 13 signs are shown in **Figure 2-19**.

[1] Prior to 2001, YOY spottail shiners were not specifically targeted for collection; collection consisted of both adult and YOY spottail shiners. **Figure 2-18** includes composite samples of fish with a maximum length of 65 millimeters (mm), the current monitoring program's criterion for distinguishing between YOY and adult spottail shiners. Also, in 2001, two groups of spottail shiners were observed in the field; one group consisted of spottail shiners spawned in the spring and the other contained spottail shiners spawned in the late summer/fall. For proper comparison, only the results for the YOY spottail shiners spawned in the spring were considered.

2.3.2 Summary of Results

All but one of the fishing advisory signs were visible from shore, and the majority of them were in good condition. Sign 13, which is located near the river mouth, was noted to have fallen, and therefore required re-installation. Photographs documenting the condition of each sign were taken and are shown in **Figure 2-19**. A photograph was taken of Sign 13 once replaced (on September 24, 2010); this is also provided in **Figure 2-19**.

Beyond Sign 13, other notable observations included:

- Sign 1 **–** The sign was bent longitudinally down the middle and at the corners; however, the text and sign were still visible/legible.
- Sign 6 **–** The lower right corner of the sign was dent/bent; however, the text and sign were still visible/legible.

These observations are consistent with those recorded in 2009 (Alcoa, July 2010).

Table 2-1
Summary of 2010 SRS Water Column Monitoring Activities

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Grasse River Study Area, Massena, New York

Round #	Sampling Date	Additional Sampling Information
1	4/29/10	The samples were targeted for Saturday delivery; however, sample delivery was delayed until Monday, resulting in a cooler temperature of 17.6 degrees Celsius. As a result, no PCB analysis was performed for samples WCMSB-1(0.5), WC013-1(0.2), WC013-1(0.2) MS/MSD, and WC013-1(0.8). TSS analysis was performed on samples from these locations/depths.
2	5/19/10	Additional MS/MSD samples and an additional PCB duplicate sample were collected during this round to satisfy the QA/QC requirements for Round 1.
3	6/10/10	--
4	6/30/10	--
5	7/21/10	One sample cooler (targeted for Thursday delivery) was lost in transit. The cooler was returned to the shipment origination point on Friday, and re-shipped for Saturday delivery, resulting in a cooler temperature of 16.0 degrees Celsius. As a result, no PCB analysis was performed for samples WC131-5(0.2), WC131-5(0.2) MS/MSD, WC011-5(0.2), and Dup(WC-10-5). TSS analysis was performed on samples from these locations/depths.
6	8/12/10	Additional MS/MSD samples and an additional PCB duplicate sample were collected during this round to satisfy the QA/QC requirements for Round 5.
7	9/2/10	--
8	9/21/10	--
9	10/13/10	--

Notes:
1. SRS = Supplemental Remedial Studies
2. PCB = polychlorinated biphenyl
3. TSS = total suspended solids
4. MS/MSD = matrix spike/matrix spike duplicate
5. QA/QC = quality assurance/quality control
6. -- Not Applicable

Table 2-2.
2010 SRS Water Column Monitoring Activites
PCB Results

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Grasse River Study Area, Massena, New York

Round	Date	Flow[4] [cfs]	Mean Temperature[5] [deg C]	Mean Conductivity[5] [µS/cm]	Fraction of Total Water Depth[6]	Total PCBs [ng/L][7] WCMSB	WC131	WC011	WC013
1	April 29	1,265	9.0	136	0.2	--- [9] (0.0) [8]	13.1	16.0	--- [9]
					0.8		9.8	16.4	--- [9]
2	May 19	626	18.5	100	0.2	0.0 [8]	6.4	15.3 (8.5)	25.2 (21.3)
					0.8		13.2	17.3	8.1
3	June 10	663	16.4	121	0.2	0.0 (0.0) [8]	13.1	11.8	17.2
					0.8		15.3	17.2	0.7
4	June 30	1,397	21.4	112	0.2	0.0 (0.0) [8]	0.0 [8]	0.0 [8]	0.0 [8]
					0.8		0.0 [8]	0.0 [8]	--- [10]
5	July 21	932	26.0	168	0.2	0.0 [8]	--- [9]	--- [9,11]	18.2
					0.8		15.6	25.7	5.2
6	August 12	208	24.9	160	0.2	0.0 [8]	7.8	33.3 (14.8)	19.7 (27.3)
					0.8		26.8	23.2	16.8
7	September 2	230	24.2	162	0.2	0.0 (0.0) [8]	12.2	11.3	6.9
					0.8		21.1	16.0	0.9
8	September 21	472	26.5	99	0.2	0.0 [8]	5.3	1.3	6.5
					0.8		4.6	10.1 (3.3)	9.1
9	October 13	982	10.8	83	0.2	0.0 [8]	0.0 [8]	0.0 [8]	9.1 (6.0)
					0.8		0.0 [8]	0.0 [8]	8.4

Notes:
1. Duplicate values in parentheses.
2. All samples unfiltered.
3. Units: cfs = cubic feet per second; deg C = degrees Celsius; µS/cm = micro-Siemens per centimeter; ng/L = nanogram per liter.
4. Daily average flows are calculated from records at the USGS gage at Chase Mills.
5. Mean excludes transects where stratification was observed.
6. Water samples at WCMSB collected at 0.5*total water depth.
7. Locations shown on Figure 2-1.
8. The concentrations of all PCB congeners were reported as non-detect (less than the per congener method detection limit [MDL] of 0.2 ng/L). The total PCB concentration reported by the laboratory is the sum of all congener concentrations above the MDL.
9. No PCB analysis could be performed due to shipping error which caused an exceedance of cooler temperature.
10. Total PCB results for sample WC013-4 (0.8) have been excluded due to possible cross-contamination at the laboratory.
11. Two duplicate samples were collected in Round 6 to fulfill the QAQC requirements. The duplicate collected during Round 5 was in the cooler discussed in note 9 and therefore could not be analyzed.

Table 2-3.
2010 SRS Water Column Monitoring Activites
Total Suspended Solids Results

2010 Data Summary Report
Grasse River Study Area, Massena, New York

Round	Date	Flow[5] [cfs]	Mean Temperature[6] [deg C]	Mean Conductivity[6] [µS/cm]	Fraction of Total Water Depth[7]	Total Suspended Solids [mg/L][8] WCMSB	WC131	WC011	WC013
1	April 29	1,265	9.0	136	0.2	2.2 (2.1)	5.1	4.5	5.5
					0.8		5.3	4.6	4.8
2	May 19	626	18.5	100	0.2	ND	1.6	1.8 (1.5)	2.5
					0.8		2.3	2.7	1.4
3	June 10	663	16.4	121	0.2	1.5 (2.2)	3.3	2.2	2.0
					0.8		3.6	2.8	1.4
4	June 30	1,397	21.4	112	0.2	5.8 (6.6)	4.5	4.8	3.8
					0.8		5.2	4.6	2.7
5	July 21	932	26.0	168	0.2	2.6	2.2	1.6 (2.1)	1.8
					0.8		3.1	2.7	1.4
6	August 12	208	24.9	160	0.2	1.7	3.6	4.0 (3.7)	2.4
					0.8		3.5	3.8	2.5
7	September 2	230	24.2	162	0.2	ND (ND)	2.3	1.7	2.2
					0.8		3.6	3.0	1.7
8	September 21	472	26.5	99	0.2	1.4	2.0	3.1	2.7
					0.8		1.9	3.7 (3.3)	2.7
9	October 13	982	10.8	83	0.2	3.2	1.6	2.2	2.7 (3.7)
					0.8		2.0	2.2	3.0

Notes:
1. Duplicate values in parentheses.
2. All samples unfiltered.
3. ND = 'Not Detected'; sample concentration was below the detection limit (approximately 0.97 mg/L).
4. Units: cfs = cubic feet per second; deg C = degrees Celsius; µS/cm = microSiemens per centimeter; mg/L = milligrams per liter.
5. Daily average flows are calculated from records at the USGS gage at Chase Mills.
6. Mean excludes transects where stratification was observed.
7. Water samples at WCMSB collected at 0.5*total water depth.
8. Locations shown on Figure 2-1.

Table 2-4.
2010 Resident Fish Trend Monitoring Sampling Report
Number of Samples Collected/Number of Samples Targeted

2010 Data Summary Report
Grasse River Study Area, Massena, New York

Resident Fish Species	Grasse River Stretch Number of Samples Collected/Number of Samples Targeted				
	Background	Upper	Middle	Lower	Power Canal
Adult Smallmouth Bass	5 / 5	17 / 17	17 / 17	17 / 17	17 / 17
Adult Brown Bullhead	5 / 5	18 / 18	18 / 18	18 / 18	not targeted

Resident Fish Species	Grasse River Location Number of Samples Collected/Number of Samples Targeted			
	Background	Near Outfall 001	Near Unnamed Tributary	Mouth of River
Young-of-Year Spottail Shiner	3 / 3	3 / 3	3 / 3	3 / 3

Table 2-5.
2010 Resident Fish Trend Monitoring Study
Adult Resident Fish Collection Field and Laboratory Data - Smallmouth Bass and Brown Bullhead

2010 Data Summary Report
Grasse River Study Area, Massena, New York

Sample Area	Species	Sample ID	Date Collected	Length (cm)	Weight (g)	Lipid (%)	PCB (mg/kg wet)	PCB (mg/kg lipid)
Background Stretch	Smallmouth bass	FS1-729-SB	9/8/10	27.2	310	0.25	ND	10
		FS1-730-SB	9/8/10	40.3	982	0.23	ND	11
		FS1-731-SB	9/8/10	33.7	567	0.75	ND	3
		FS1-732-SB	9/8/10	32.4	462	0.40	ND	6
		FS1-733-SB	9/8/10	32.0	487	0.48	ND	5
	Brown bullhead	FS1-734-BB	9/8/10	25.6	254	0.53	ND	5
		FS1-735-BB	9/8/10	26.0	218	0.76	ND	3
		FS1-736-BB	9/8/10	27.8	295	1.23	ND	2
		FS1-737-BB	9/8/10	25.2	252	0.60	ND	4
		FS1-738-BB	9/8/10	30.3	298	2.14	ND	1
Upper Stretch	Smallmouth bass	FS2-751-SB	9/13/10	33.1	504	0.23	0.86	380
		FS2-752-SB	9/13/10	31.5	543	0.64	1.41	221
		FS2-753-SB	9/13/10	32.4	486	1.00	1.60	160
		FS2-754-SB	9/13/10	32.7	466	0.96	1.04	109
		FS2-755-SB	9/13/10	39.1	972	0.47	1.00	211
		FS2-756-SB	9/13/10	26.8	253	0.20	0.18	91
		FS2-757-SB	9/13/10	38.4	866	0.34	1.33	395
		FS2-758-SB	9/13/10	29.2	351	0.62	1.61	259
		FS2-759-SB	9/13/10	34.9	661	1.28	1.54	120
		FS2-760-SB	9/13/10	29.3	352	0.17	0.27	165
		FS2-761-SB	9/13/10	27.0	310	0.27	0.26	99
		FS2-762-SB	9/13/10	32.5	514	0.73	1.03	141
		FS2-763-SB	9/13/10	30.4	407	0.23	0.11	49
		FS2-764-SB	9/13/10	30.1	388	0.10	0.12	116
		FS2-765-SB	9/13/10	26.0	234	0.94	0.57	61
		FS2-766-SB	9/13/10	28.2	317	1.28	1.22	95
		FS2-767-SB	9/13/10	31.3	444	0.82	1.00	121
	Brown bullhead	FS2-768-BB	9/13/10	35.6	580	0.45	3.31	743
		FS2-769-BB	9/13/10	29.5	397	1.22	1.16	95
		FS2-770-BB	9/13/10	32.1	513	1.96	3.53	180
		FS2-771-BB	9/13/10	32.2	548	1.71	1.71	100
		FS2-772-BB	9/13/10	30.9	420	1.80	1.49	83
		FS2-773-BB	9/13/10	34.3	665	1.86	3.67	197
		FS2-774-BB	9/13/10	36.2	712	2.46	4.83	196
		FS2-775-BB	9/13/10	25.9	241	0.11	0.13	124
		FS2-776-BB	9/13/10	30.8	510	2.19	1.62	74
		FS2-777-BB	9/13/10	28.8	388	0.75	0.42	56
		FS2-778-BB	9/13/10	28.6	327	0.15	0.18	123
		FS2-779-BB	9/13/10	28.2	350	0.33	0.36	110
		FS2-780-BB	9/13/10	25.2	215	0.06	0.14	215
		FS2-781-BB	9/13/10	28.1	282	0.19	0.37	201
		FS2-782-BB	9/13/10	28.2	306	0.55	0.30	54
		FS2-783-BB	9/13/10	25.1	249	0.61	0.25	41
		FS2-784-BB	9/13/10	26.3	220	0.65	0.47	73
		FS2-785-BB	9/13/10	25.4	224	0.73	0.27	37
Middle Stretch	Smallmouth bass	FS3-786-SB	9/14/10	40.1	980	1.42	2.48	174
		FS3-787-SB	9/14/10	39.8	943	1.46	1.49	102
		FS3-788-SB	9/14/10	42.0	1,056	1.09	0.42	39
		FS3-789-SB	9/14/10	33.7	468	0.55	0.90	162

Notes provided on page 3 of 3

Table 2-5.
2010 Resident Fish Trend Monitoring Study
Adult Resident Fish Collection Field and Laboratory Data - Smallmouth Bass and Brown Bullhead

2010 Data Summary Report
Grasse River Study Area, Massena, New York

Sample Area	Species	Sample ID	Date Collected	Length (cm)	Weight (g)	Lipid (%)	PCB (mg/kg wet)	PCB (mg/kg lipid)
Middle Stretch (continued)	Smallmouth bass	FS3-790-SB	9/14/10	31.9	469	0.88	1.49	168
		FS3-791-SB	9/14/10	30.8	421	1.44	2.26	157
		FS3-792-SB	9/14/10	35.2	652	0.67	1.64	245
		FS3-793-SB	9/14/10	35.0	620	0.88	1.35	153
		FS3-794-SB	9/14/10	37.3	745	1.12	1.26	113
		FS3-795-SB	9/14/10	30.5	406	0.79	1.21	154
		FS3-796-SB	9/14/10	38.3	1,049	3.14	0.28	9
		FS3-797-SB	9/14/10	30.3	345	0.66	0.92	140
		FS3-798-SB	9/14/10	26.7	292	0.99	0.79	80
		FS3-799-SB	9/14/10	27.4	310	0.98	1.21	123
		FS3-800-SB	9/14/10	27.8	293	1.08	1.65	153
		FS3-801-SB	9/14/10	40.5	922	1.00	1.49	149
		FS3-802-SB	9/14/10	27.7	314	0.67	0.71	106
	Brown bullhead	FS3-803-BB	9/14/10	35.4	638	1.34	1.61	120
		FS3-804-BB	9/14/10	35.3	698	2.16	2.42	112
		FS3-805-BB	9/14/10	27.3	247	0.57	0.50	88
		FS3-806-BB	9/14/10	32.0	415	0.70	0.62	89
		FS3-807-BB	9/14/10	28.7	309	1.12	0.74	66
		FS3-808-BB	9/14/10	34.4	526	2.21	2.21	100
		FS3-809-BB	9/14/10	30.5	373	1.99	1.63	82
		FS3-810-BB	9/14/10	32.2	460	3.08	2.25	73
		FS3-811-BB	9/14/10	29.0	317	0.85	1.22	144
		FS3-812-BB	9/14/10	32.9	444	1.17	0.78	67
		FS3-813-BB	9/14/10	29.0	332	1.18	0.91	77
		FS3-814-BB	9/14/10	26.6	230	0.54	0.30	56
		FS3-815-BB	9/14/10	30.9	395	1.72	1.75	102
		FS3-816-BB	9/14/10	31.0	392	1.70	2.40	141
		FS3-817-BB	9/14/10	32.0	464	2.37	1.96	83
		FS3-818-BB	9/14/10	29.4	327	1.09	0.32	30
		FS3-819-BB	9/14/10	33.3	452	1.81	0.32	18
		FS3-820-BB	9/14/10	27.2	293	0.57	1.34	236
Lower Stretch	Smallmouth bass	FS4-821-SB	9/14/10	41.4	1,351	2.51	0.26	10
		FS4-822-SB	9/14/10	37.6	673	0.73	1.83	250
		FS4-823-SB	9/14/10	28.5	346	0.73	0.67	93
		FS4-824-SB	9/14/10	25.3	227	0.48	0.77	162
		FS4-825-SB	9/14/10	32.0	422	0.40	0.93	231
		FS4-826-SB	9/14/10	31.7	483	0.44	0.51	115
		FS4-827-SB	9/14/10	25.4	236	0.33	0.51	156
		FS4-828-SB	9/14/10	31.6	434	0.32	0.68	216
		FS4-829-SB	9/14/10	32.0	396	0.37	0.68	184
		FS4-830-SB	9/14/10	27.1	328	0.58	0.98	170
		FS4-831-SB	9/14/10	26.9	288	0.55	0.82	149
		FS4-832-SB	9/14/10	26.8	269	0.54	0.71	132
		FS4-833-SB	9/14/10	27.7	320	0.52	0.73	142
		FS4-834-SB	9/14/10	29.3	382	0.47	0.41	87
		FS4-835-SB	9/16/10	33.3	493	0.49	0.88	178
		FS4-836-SB	9/16/10	27.3	284	0.25	0.58	236
		FS4-837-SB	9/16/10	38.1	754	0.52	0.28	54

Notes provided on page 3 of 3

Table 2-5.
2010 Resident Fish Trend Monitoring Study
Adult Resident Fish Collection Field and Laboratory Data - Smallmouth Bass and Brown Bullhead

2010 Data Summary Report
Grasse River Study Area, Massena, New York

Sample Area	Species	Sample ID	Date Collected	Length (cm)	Weight (g)	Lipid (%)	PCB (mg/kg wet)	PCB (mg/kg lipid)
Lower Stretch (continued)	Brown bullhead	FS4-838-BB	9/14/10	34.7	629	3.70	6.07	164
		FS4-839-BB	9/14/10	33.3	575	2.86	2.73	95
		FS4-840-BB	9/14/10	35.3	684	1.23	1.47	119
		FS4-841-BB	9/14/10	34.7	621	0.93	1.80	193
		FS4-842-BB	9/14/10	32.0	436	0.89	0.55	62
		FS4-843-BB	9/14/10	31.3	422	1.30	1.52	117
		FS4-844-BB	9/14/10	26.3	298	1.08	0.73	68
		FS4-845-BB	9/14/10	32.2	469	2.76	1.92	70
		FS4-846-BB	9/14/10	31.0	430	1.34	0.79	59
		FS4-847-BB	9/14/10	31.2	412	1.52	1.03	68
		FS4-848-BB	9/14/10	32.4	477	0.85	0.90	105
		FS4-849-BB	9/14/10	32.0	474	1.74	3.83	220
		FS4-850-BB	9/14/10	33.1	469	2.17	1.43	66
		FS4-851-BB	9/14/10	34.5	574	0.90	1.49	164
		FS4-852-BB	9/14/10	31.7	494	2.10	1.57	75
		FS4-853-BB	9/14/10	31.7	487	0.55	0.82	150
		FS4-854-BB	9/14/10	32.4	523	2.96	2.94	99
		FS4-855-BB	9/14/10	34.9	597	1.68	1.87	111
Power Canal	Smallmouth bass	FS6-856-SB	9/21/10	44.7	1,091	0.44	0.29	65
		FS6-857-SB	9/21/10	31.2	387	1.03	0.27	26
		FS6-858-SB	9/21/10	29.8	338	0.70	0.06	9
		FS6-859-SB	9/21/10	46.0	1,668	2.64	0.06	2
		FS6-860-SB	9/21/10	27.3	241	0.77	0.24	31
		FS6-861-SB	9/21/10	26.3	205	0.68	0.24	35
		FS6-862-SB	9/21/10	27.4	266	0.32	0.09	29
		FS6-863-SB	9/21/10	33.3	502	0.79	0.09	11
		FS6-864-SB	9/21/10	27.0	228	0.26	ND	10
		FS6-865-SB	9/21/10	26.9	228	0.76	0.25	33
		FS6-866-SB	9/21/10	39.1	848	0.93	0.11	12
		FS6-867-SB	9/21/10	28.7	298	0.43	ND	6
		FS6-868-SB	9/21/10	27.1	232	0.46	ND	5
		FS6-869-SB	9/21/10	26.2	218	0.90	0.37	41
		FS6-870-SB	9/21/10	26.9	218	0.60	0.24	39
		FS6-871-SB	9/21/10	28.5	307	0.87	0.18	21
		FS6-872-SB	9/21/10	43.8	1,191	0.51	0.17	33

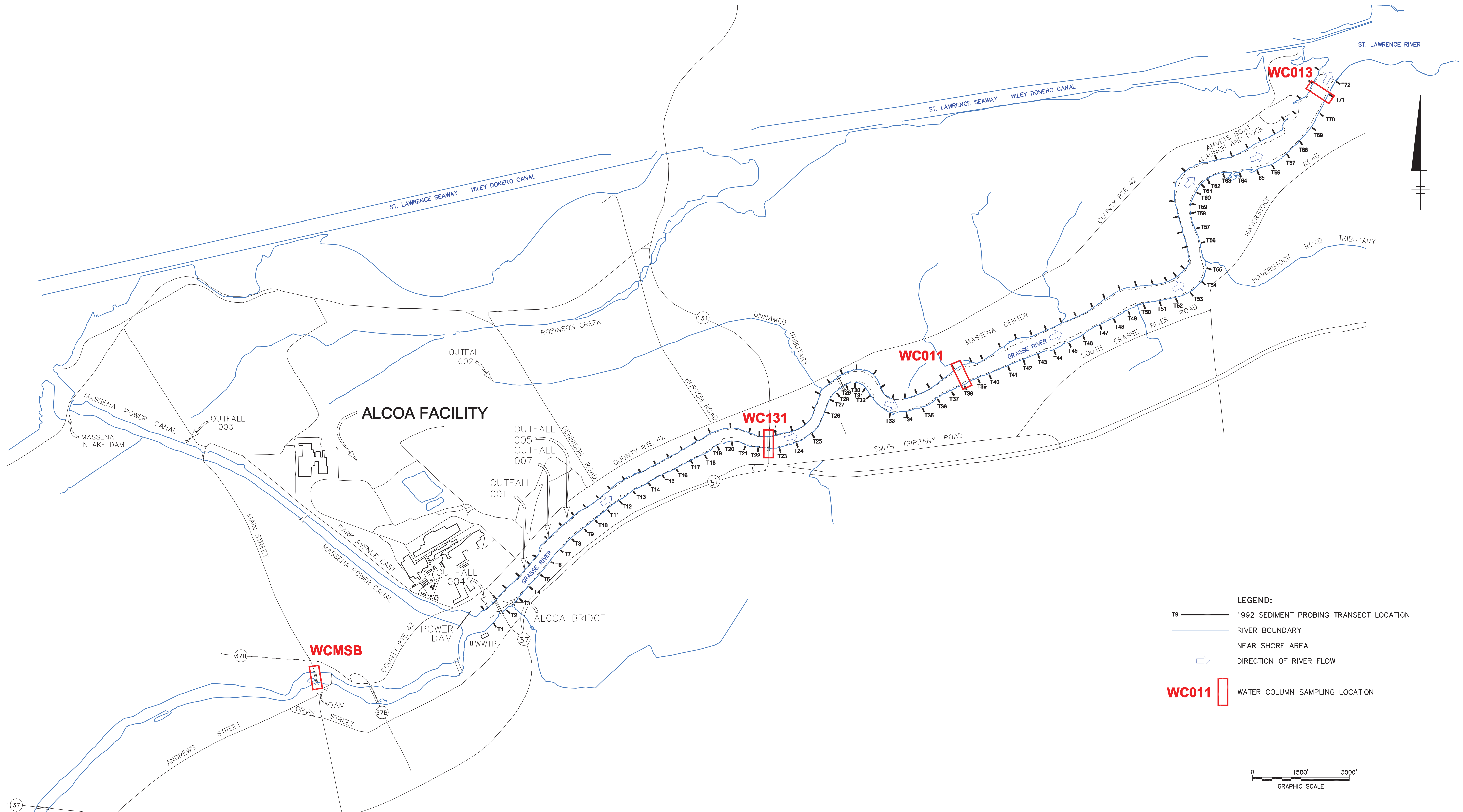
Notes:
1. Units: cm = centimeter, g = gram, mg/kg = milligrams per kilogram
2. ND = not detected; The detection limit is approximately 0.05 mg/kg for non-detected samples.
3. PCB concentrations quantified on an Aroclor basis.
4. If PCB concentration was not detected, PCB concentration on a wet weight basis was set to half the detection limit prior to computing PCB concentration on a lipid basis
5. Smallmouth bass fillets - skin-on, scales-off; brown bullhead fillets - skin-off
6. Sampling locations shown on Figures 2-11 and 2-12.

Table 2-6.
2010 Resident Fish Trend Monitoring Study
Resident Fish Collection Field and Laboratory Data - Young-of-Year Spottail Shiner

2010 Data Summary Report
Grasse River Study Area, Massena, New York

Species	Sample Area	Sample ID	Date Collected	Fish per Sample	Length Range (cm)	Weight (g)	Lipid (%)	PCB (mg/kg wet)	PCB (mg/kg lipid)
Spottail Shiner	Background Stretch	FS1-739-SS	9/8/10	21	4.6 - 5.8	26.7	5.48	0.07	1.3
		FS1-740-SS	9/8/10	21	4.5 - 5.7	24.3	5.69	ND	0.4
		FS1-741-SS	9/8/10	21	4.9 - 5.8	25.9	5.2	ND	0.5
	Outfall 001 (Upper Stretch)	FS2-748-SS	9/9/10	22	4.5 - 5.8	26.4	6.23	2.11	33.9
		FS2-749-SS	9/9/10	22	4.5 - 5.7	26.5	6.45	2.49	38.6
		FS2-750-SS	9/9/10	22	4.5 - 6.0	26.3	6.66	2.19	5.3
	Unnamed Tributary (Middle Stretch)	FS3-745-SS	9/8/10	24	4.7 - 5.9	30.1	6.07	1.84	30.3
		FS3-746-SS	9/8/10	24	4.7 - 5.6	28.5	7.33	2.01	27.5
		FS3-747-SS	9/8/10	24	4.4 - 5.8	28.5	5.79	2.06	35.5
	Grasse River Mouth (Downstream of Lower Stretch)	FS5-742-SS	9/8/10	21	4.8 - 6.0	27.2	5.1	0.68	13.3
		FS5-743-SS	9/8/10	21	4.8 - 5.7	25.5	5.01	0.76	15.2
		FS5-744-SS	9/8/10	21	4.9 - 5.9	24.8	4.08	0.76	18.6

Notes:
1. Units: cm = centimeters, g = grams, mg/kg = milligrams per kilogram
2. ND = not detected; PCB concentrations quantified on an Aroclor basis.
3. If PCB concentration was not detected, PCB concentration on a wet weight basis was set to half the detection limit prior to computing PCB concentration on a lipid basis.
4. Spottail shiner - whole-body composites.
5. Sampling locations shown on Figure 2-13.



NOTE:

1. GRASSE RIVER BASE MAP TAKEN FROM PLANIMETRIC MAPPING PREPARED BY LOCKWOOD MAPPING, INC. USING 11/9/92 AERIAL PHOTOGRAPHY. EXTENT OF NEAR SHORE AREAS PROVIDED BY QUANTITATIVE ENVIRONMENTAL ANALYSIS, LLC (QEA). ST. LAWRENCE RIVER WATERLINE GENERATED USING 5/1/01 AERIAL PHOTOGRAPHY.

GRASSE RIVER STUDY AREA
MASSENA, NEW YORK
2010 DATA SUMMARY REPORT

2010 SRS PROGRAM - WATER COLUMN MONITORING LOCATIONS

ALCOA

FIGURE
2-1

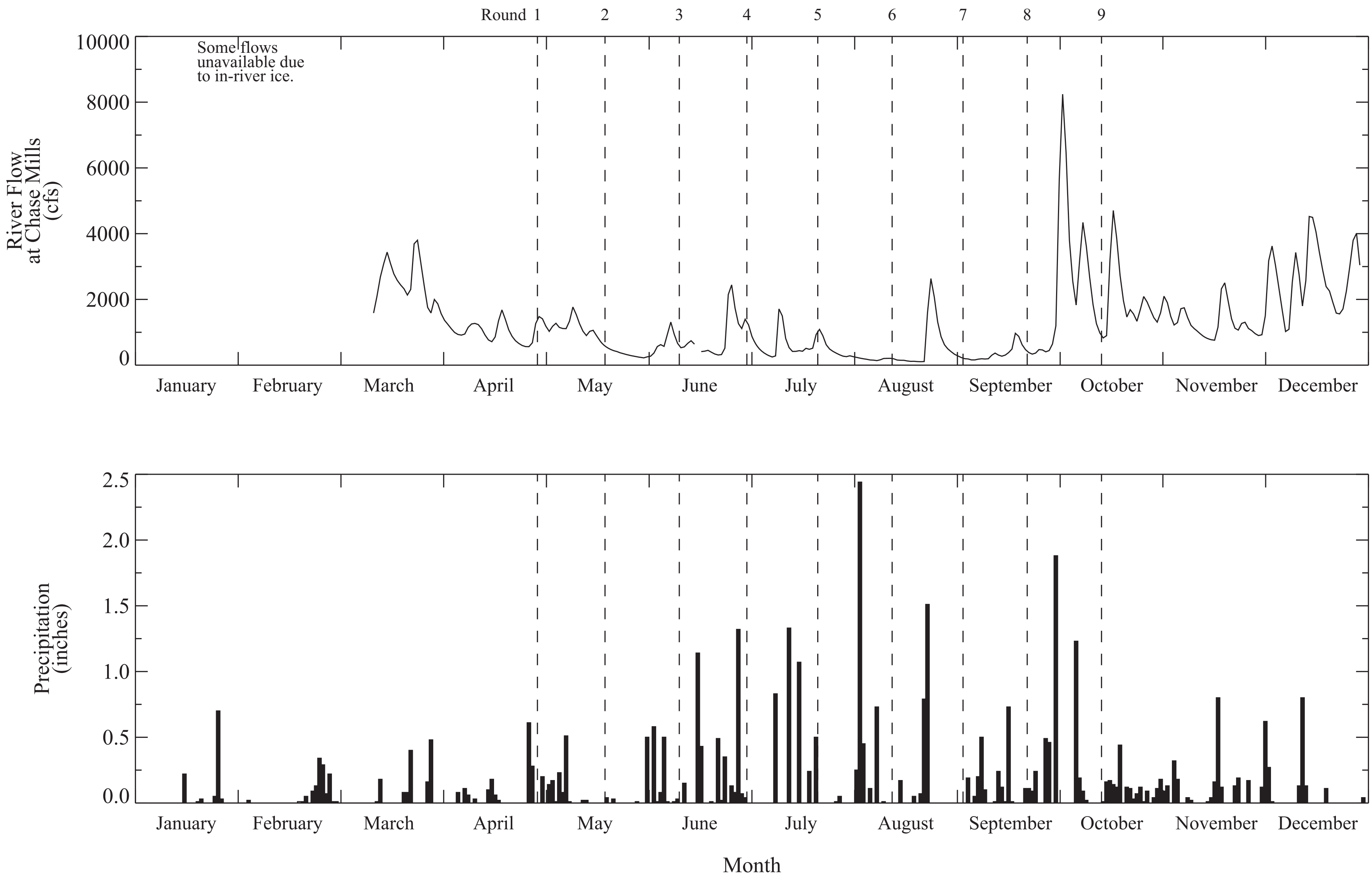


Figure 2-2. Grasse River Flow and Precipitation Information from 2010

Grasse River flow based on daily averages of flow records from the USGS gage at Chase Mills.
Grasse River precipitation measured near Outfall 007.

Data tables: climate, riverflow_chasemills, water_iupac

ARC - C:\Jobs\ALCgra\Analysis\Water\srs\flowrain.pro
Mon Jun 06 11:21:07 2011

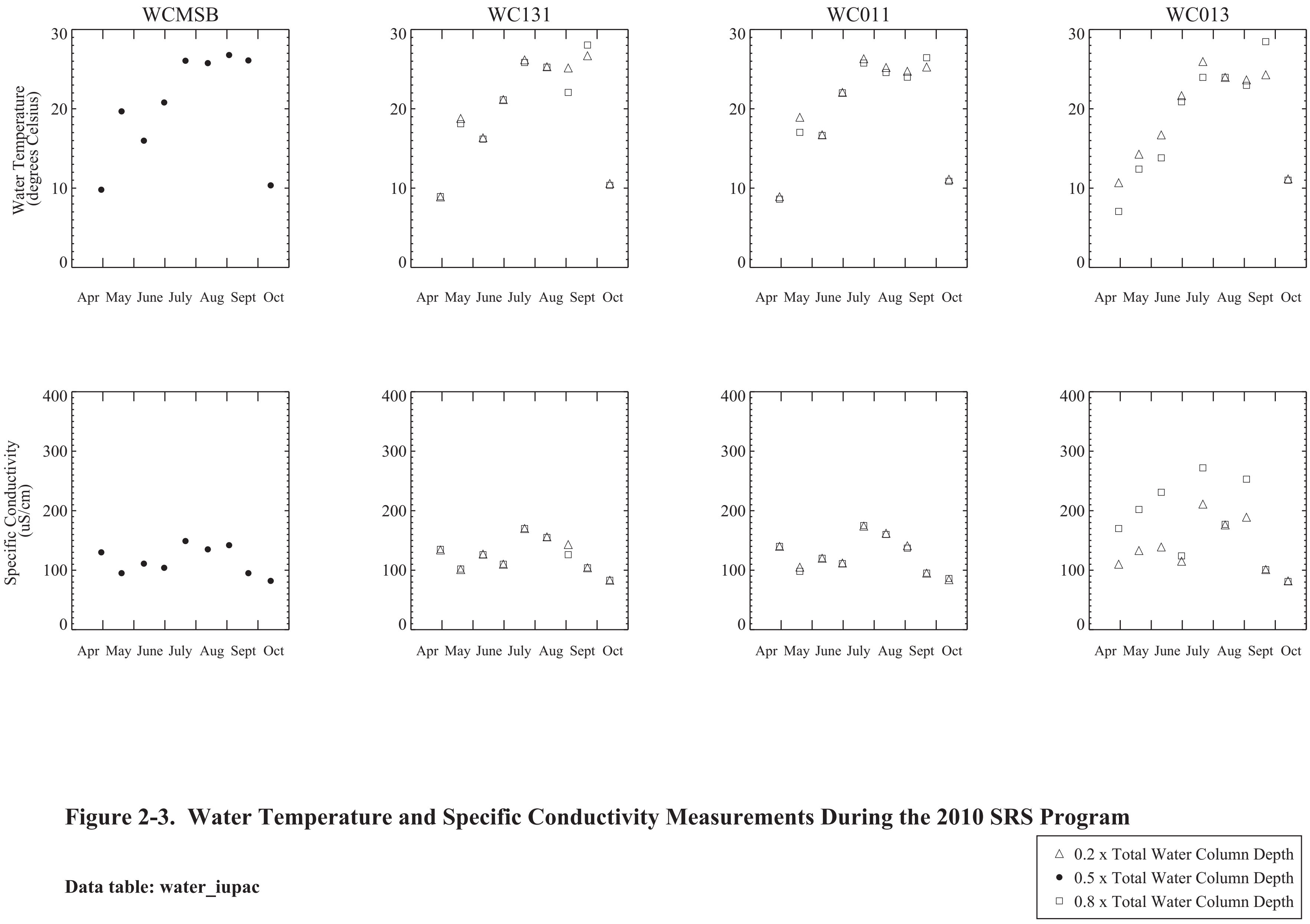


Figure 2-3. Water Temperature and Specific Conductivity Measurements During the 2010 SRS Program

Data table: water_iupac

ARC - C:\Jobs\ALCgra\Analysis\Water\srs\temp_vs_jday.pro
Mon Jun 06 11:23:05 2011

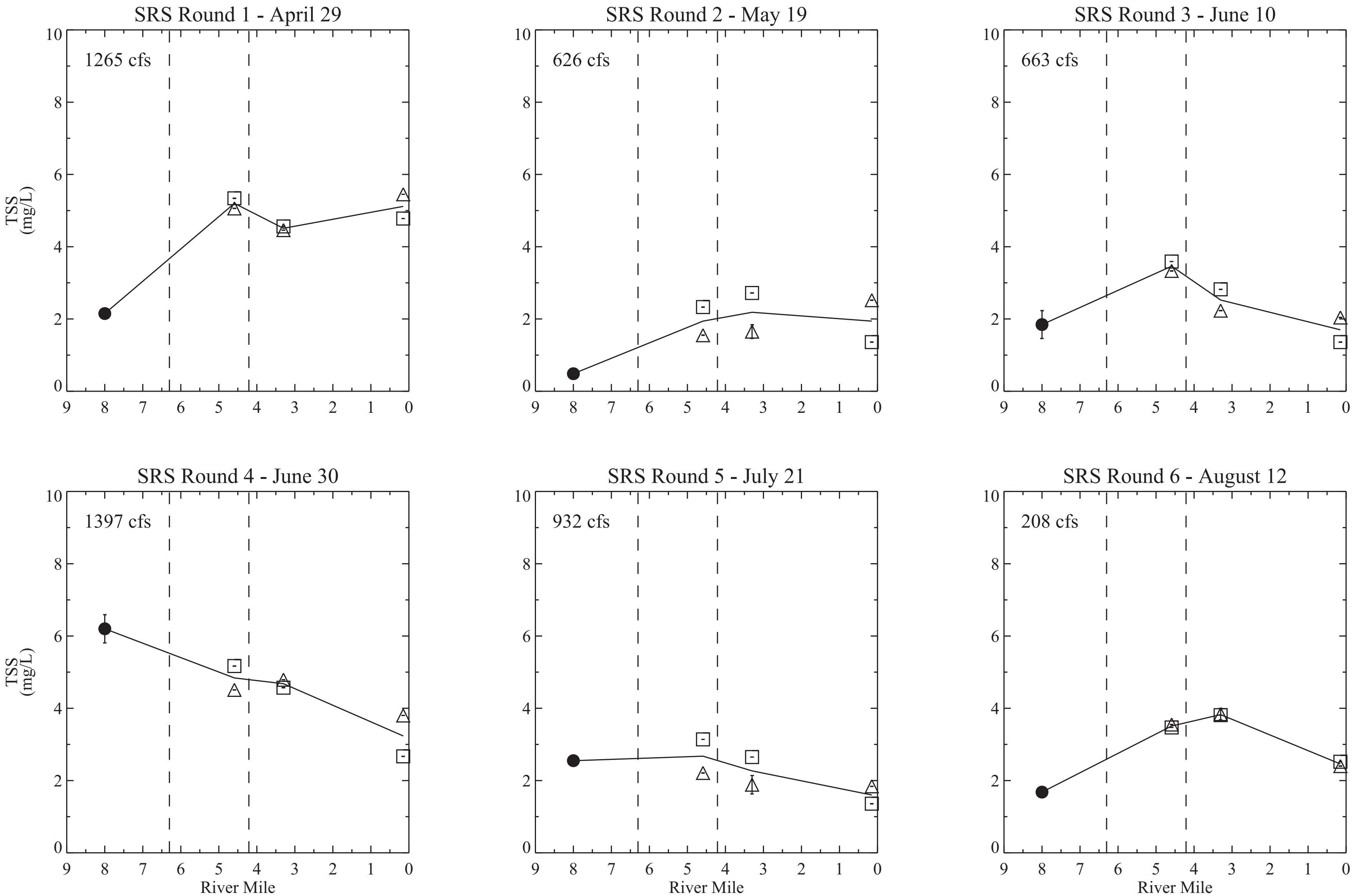


Figure 2-4a. Spatial Distribution of TSS Concentrations Measured During the 2010 SRS Program

Vertical dashed lines represent approximate locations of Outfall 001 (left) and the Unnamed Tributary (right).
Daily average flows indicated in upper left corner. Flows measured at the USGS gage at Chase Mills.
Values below the detection limit set to half the detection limit. Duplicates averaged (error bar represents range).
Data tables: riverflow_ChaseMills, water_iupac

△ 0.2 x Total Water Column Depth
• 0.5 x Total Water Column Depth
□ 0.8 x Total Water Column Depth

ARC - C:\Jobs\ALCgra\Analysis\Water\srs\all_rounds_tss_spat.pro
Mon Jun 06 11:24:16 2011

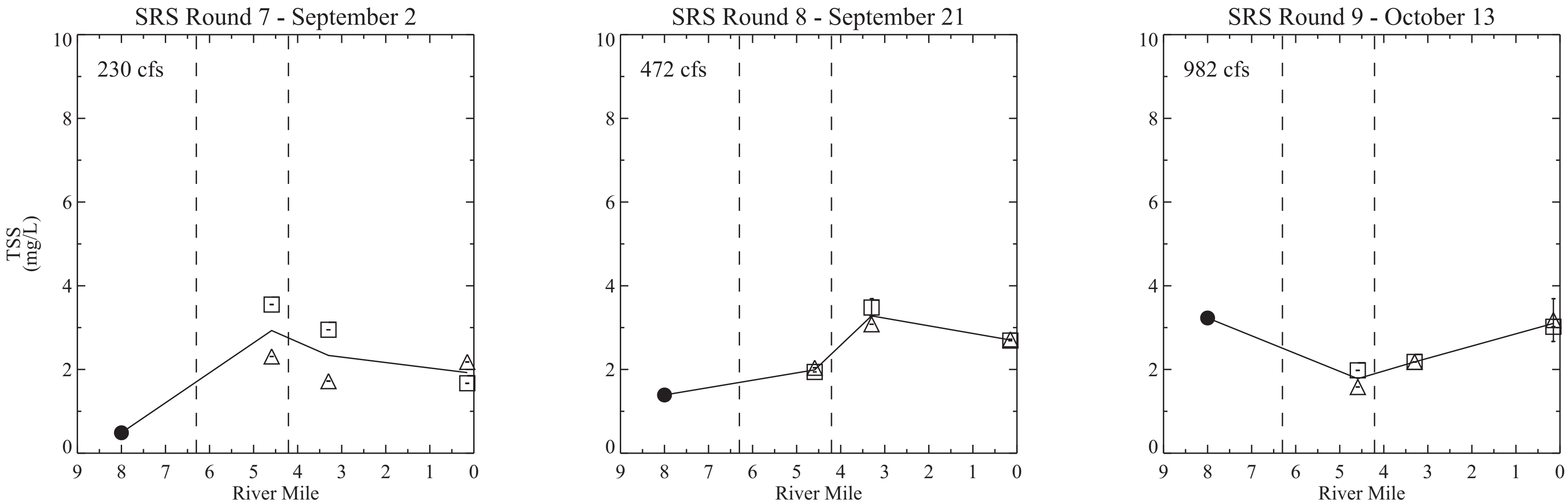


Figure 2-4b. Spatial Distribution of TSS Concentrations Measured During the 2010 SRS Program
Vertical dashed lines represent approximate locations of Outfall 001 (left) and the Unnamed Tributary (right).
Daily average flows indicated in upper left corner. Flows measured at the USGS gage at Chase Mills.
Values below the detection limit set to half the detection limit. Duplicates averaged (error bar represents range).
Data tables: riverflow_ChaseMills, water_iupac

△ 0.2 x Total Water Column Depth
• 0.5 x Total Water Column Depth
□ 0.8 x Total Water Column Depth

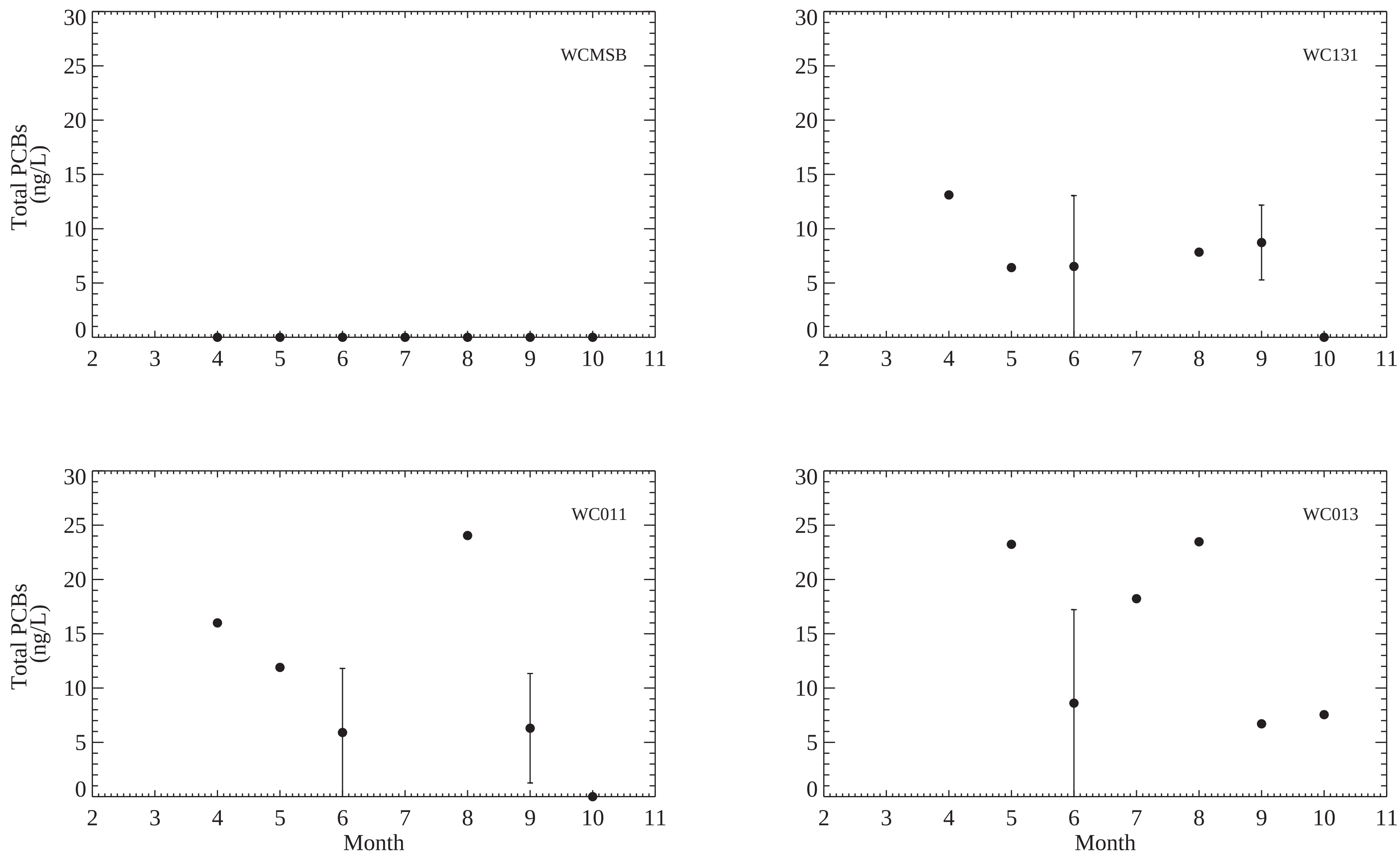


Figure 2-5. Monthly Average PCB Concentrations at Water Column Sampling Locations in 2010

Data represent surface samples collected at 0.2 times the total water depth (0.5 x depth for WCMSB) to avoid any influence of stratification.
Error bars represent range of means and are only shown for months with multiple sampling events.
Duplicates averaged with original sample.
Data table: water_iupac

ARC - C:\Jobs\ALCgra\Analysis\Water\srs\monthly_avg_pcb.pro
Mon Jun 06 11:56:43 2011

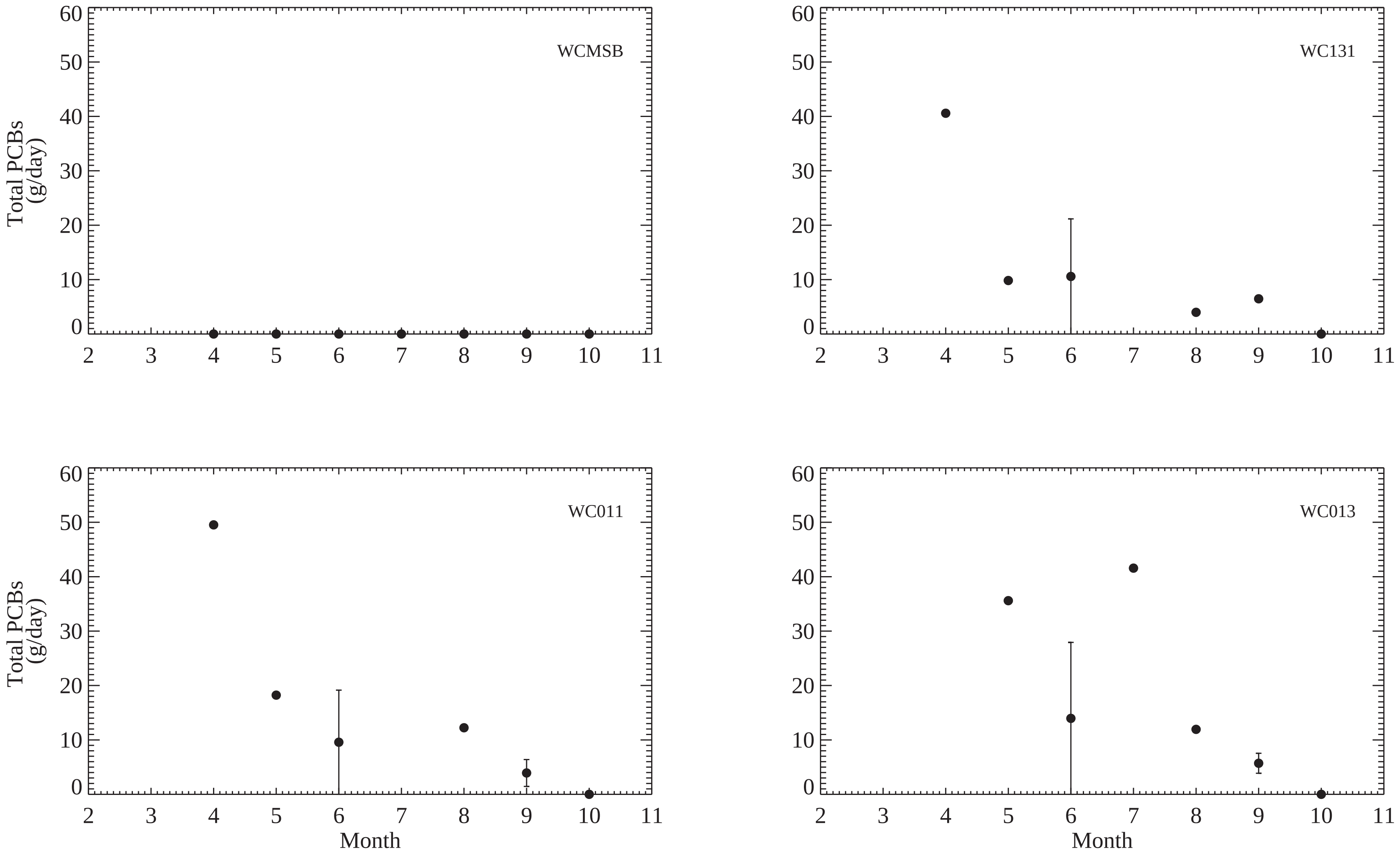


Figure 2-6. Monthly Average PCB Mass Fluxes at Water Column Sampling Locations in 2010

Data represent surface samples collected at 0.2 times the total water depth (0.5 x depth for WCMSB) to avoid any influence of stratification.
Error bars represent range of means and are only shown for months with multiple sampling events.
Duplicates averaged with original sample.
Data tables: riverflow_ChaseMills, water_iupac

ARC - C:\Jobs\ALCgra\Analysis\Water\srs\monthly_avg_pcb.pro
Mon Jun 06 11:56:43 2011

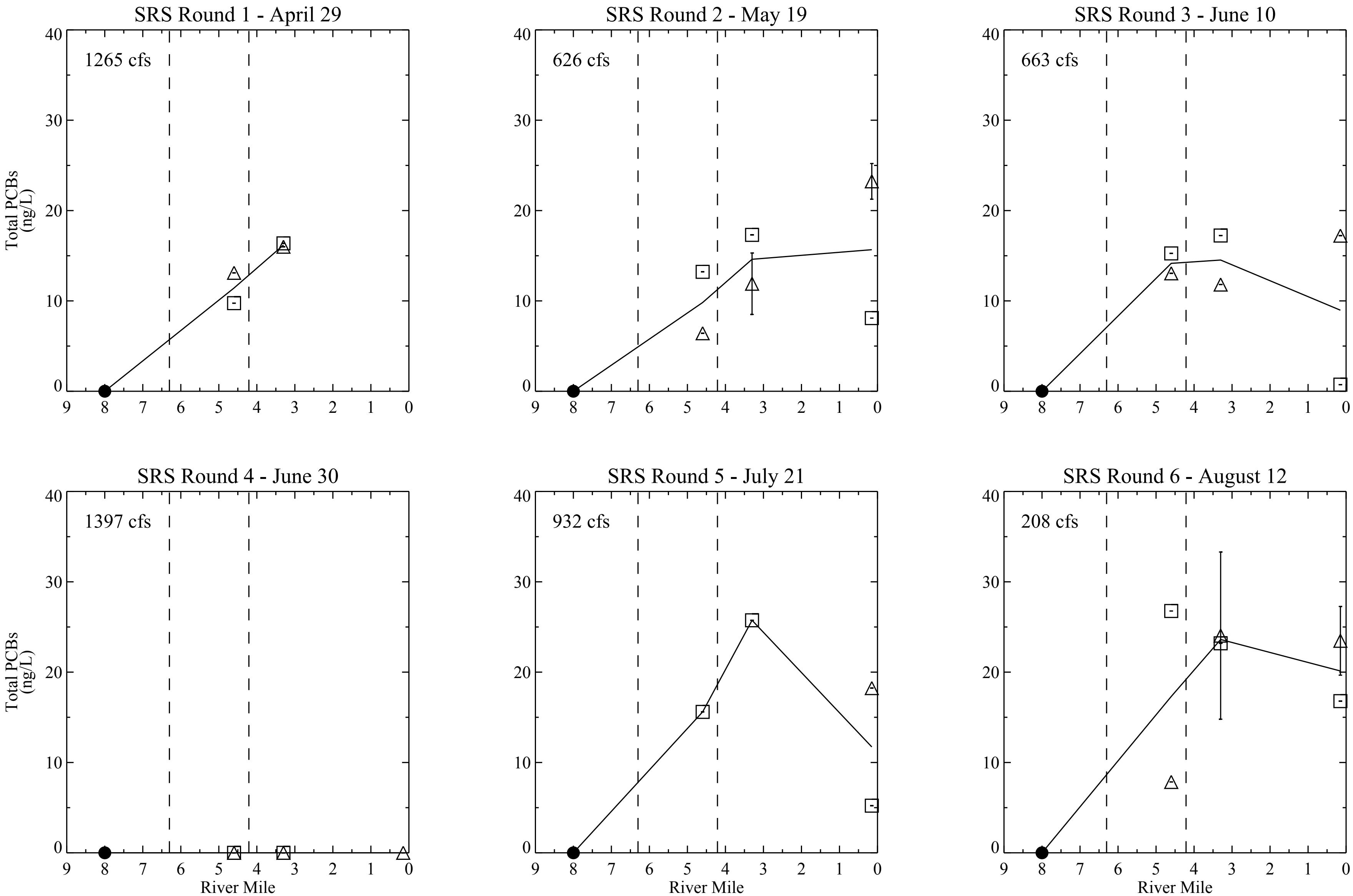


Figure 2-7a. Spatial Distribution of Total PCBs in Water Samples Collected During the 2010 SRS Program

Values represent unfiltered water column sample results. Duplicates averaged (error bar represents range).
Vertical dashed lines represent approximate locations of Outfall 001 (left) and the Unnamed Tributary (right).
Estimated daily average flows indicated in upper left corner. Flows measured at the USGS gage at Chase Mills.
The sample collected at WC-013(0.8xdepth) on 6/20/2010 has been excluded due to cross-contamination at the laboratory.
Data tables: riverflow_ChaseMills, water_iupac

△ 0.2 x Total Water Column Depth
● 0.5 x Total Water Column Depth
□ 0.8 x Total Water Column Depth

ARC - C:\Jobs\ALCgra\Analysis\Water\srs\all_rounds_tpcb_conc_spat.pro
Mon Jun 06 11:25:33 2011

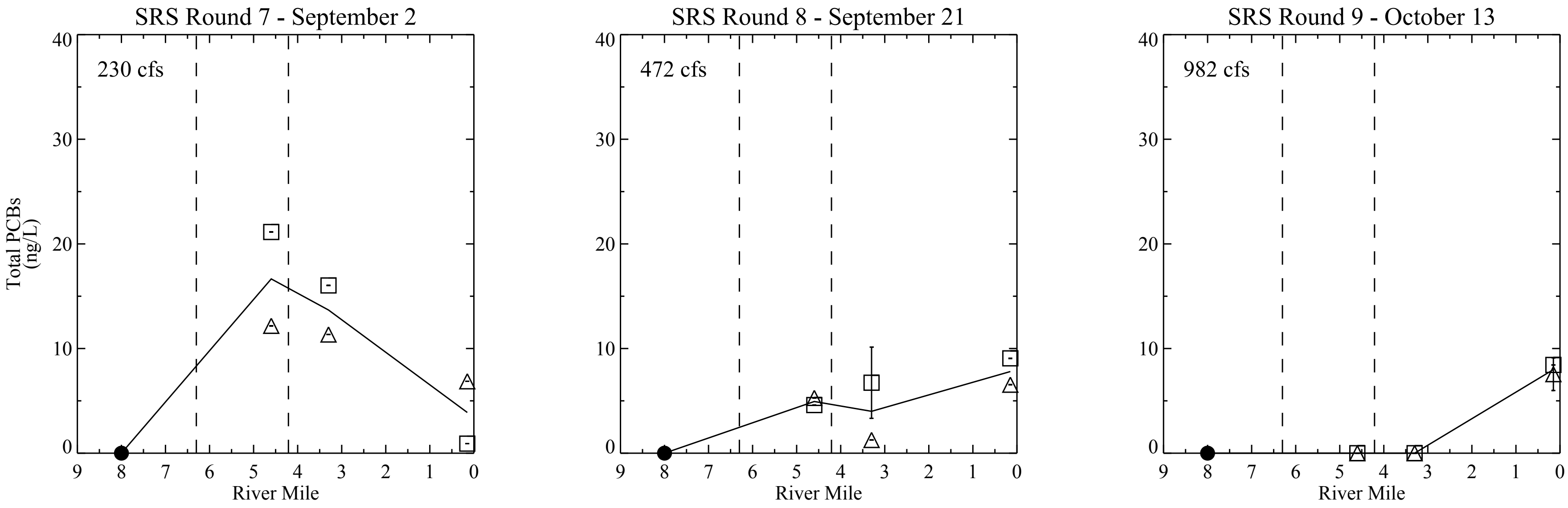


Figure 2-7b. Spatial Distribution of Total PCBs in Water Samples Collected During the 2010 SRS Program

Values represent unfiltered water column sample results. Duplicates averaged (error bar represents range).
Vertical dashed lines represent approximate locations of Outfall 001 (left) and the Unnamed Tributary (right).
Estimated daily average flows indicated in upper left corner. Flows measured at the USGS gage at Chase Mills.
The sample collected at WC-013(0.8xdepth) on 6/20/2010 has been excluded due to cross-contamination at the laboratory.
Data tables: riverflow_ChaseMills, water_iupac

△ 0.2 x Total Water Column Depth
• 0.5 x Total Water Column Depth
□ 0.8 x Total Water Column Depth

ARC - C:\Jobs\ALCgra\Analysis\Water\srs\all_rounds_tpcb_conc_spat.pro
Mon Jun 06 11:25:33 2011

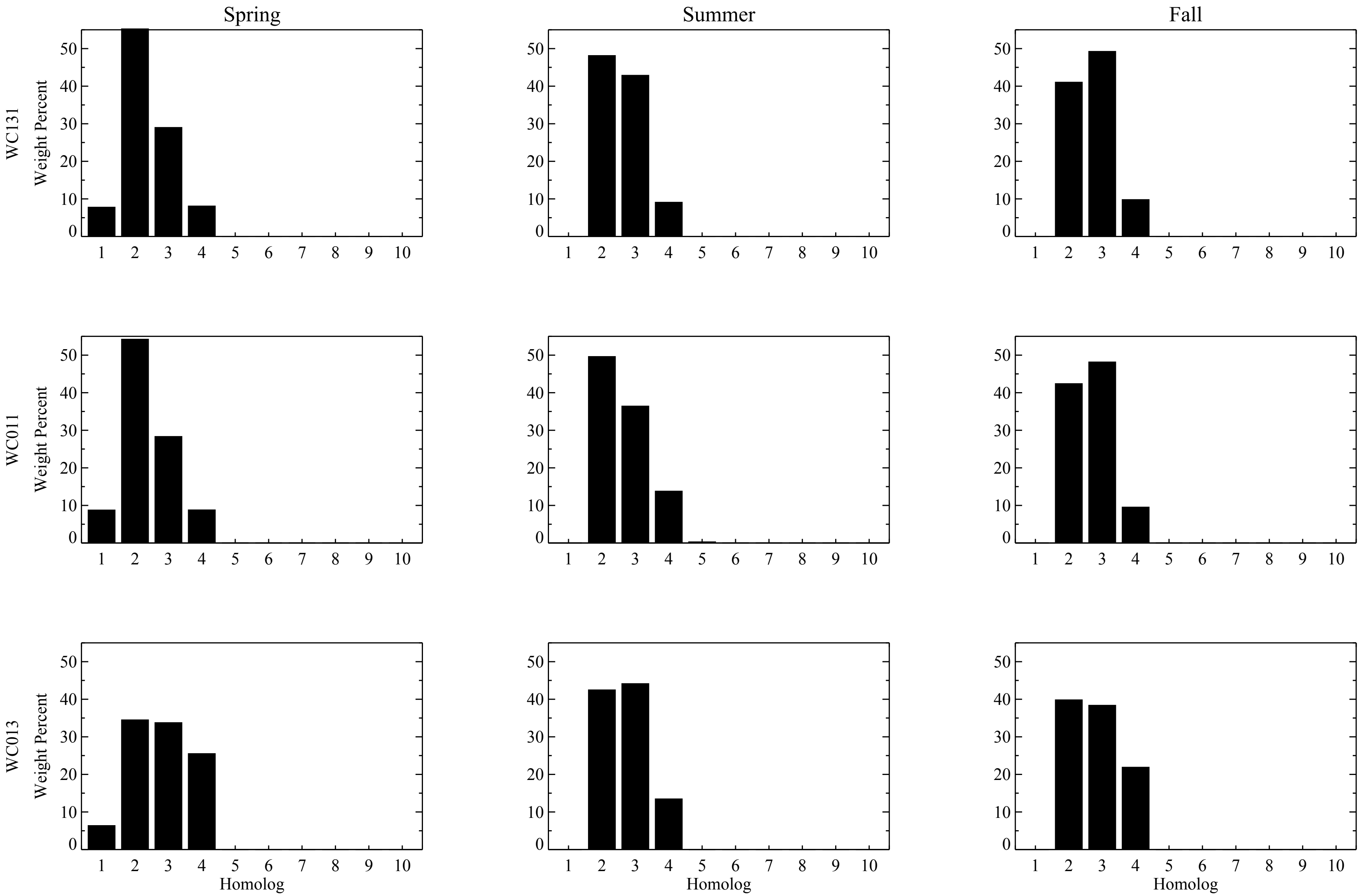


Figure 2-8. Average Homolog Distributions in Water Samples Collected in 2010
Spring - April, May, & June; Summer - July & August; Fall - September & October
Bars represent average water column results at each location for each season.
The sample collected at WC-013(0.8xdepth) on 6/20/2010 has been excluded due to cross-contamination at the laboratory.

Data table: water_iupac

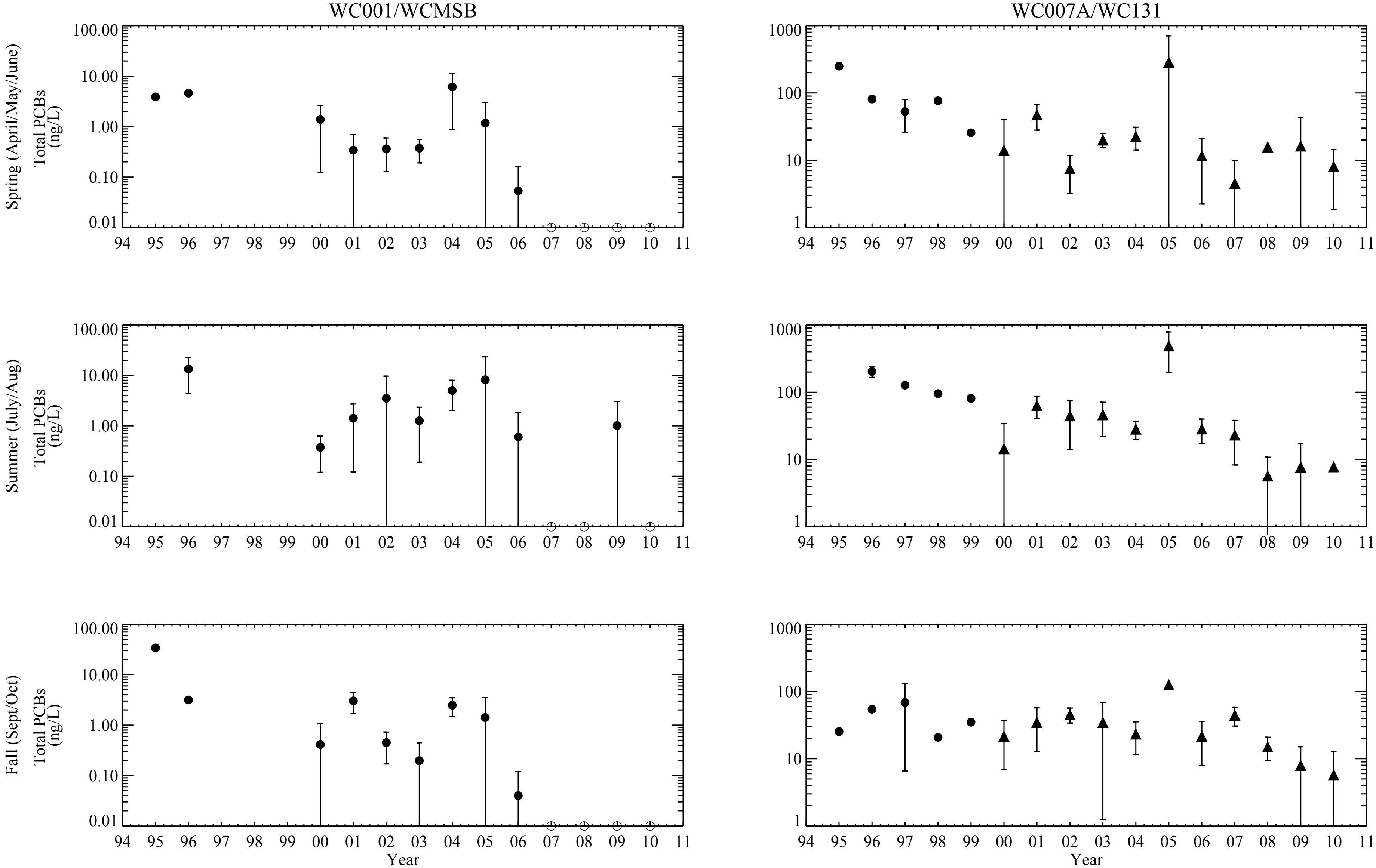


Figure 2-9a. Seasonal Average Water Column PCB Concentrations Measured During Non-Stratified Periods (WC001/WCMSB and WC007A/WC131)

Data represent samples collected when river flow was less than or equal to 2200 cfs. Triangles represent surface samples collected at WC131.
1995 to 1999 data represent composite samples collected during non-stratified periods.
2000 to 2010 data represent surface samples collected at 0.2 times the total water depth to avoid any influence of stratification.
Error bars represent two standard errors of the mean; no error bars shown if sample count is fewer than three.
Duplicates averaged; data collected on same day averaged. Non-detects are plotted at 0.01 ng/L as open circles.
Data tables: riverflow_hist, water_bz, water_peak, water_iupac

ARC - C:\Jobs\ALCgra\Analysis\Water\srs\PCB_temporal_MSB_131_011_013_DSR.pro
Tue Jul 05 11:17:43 2011

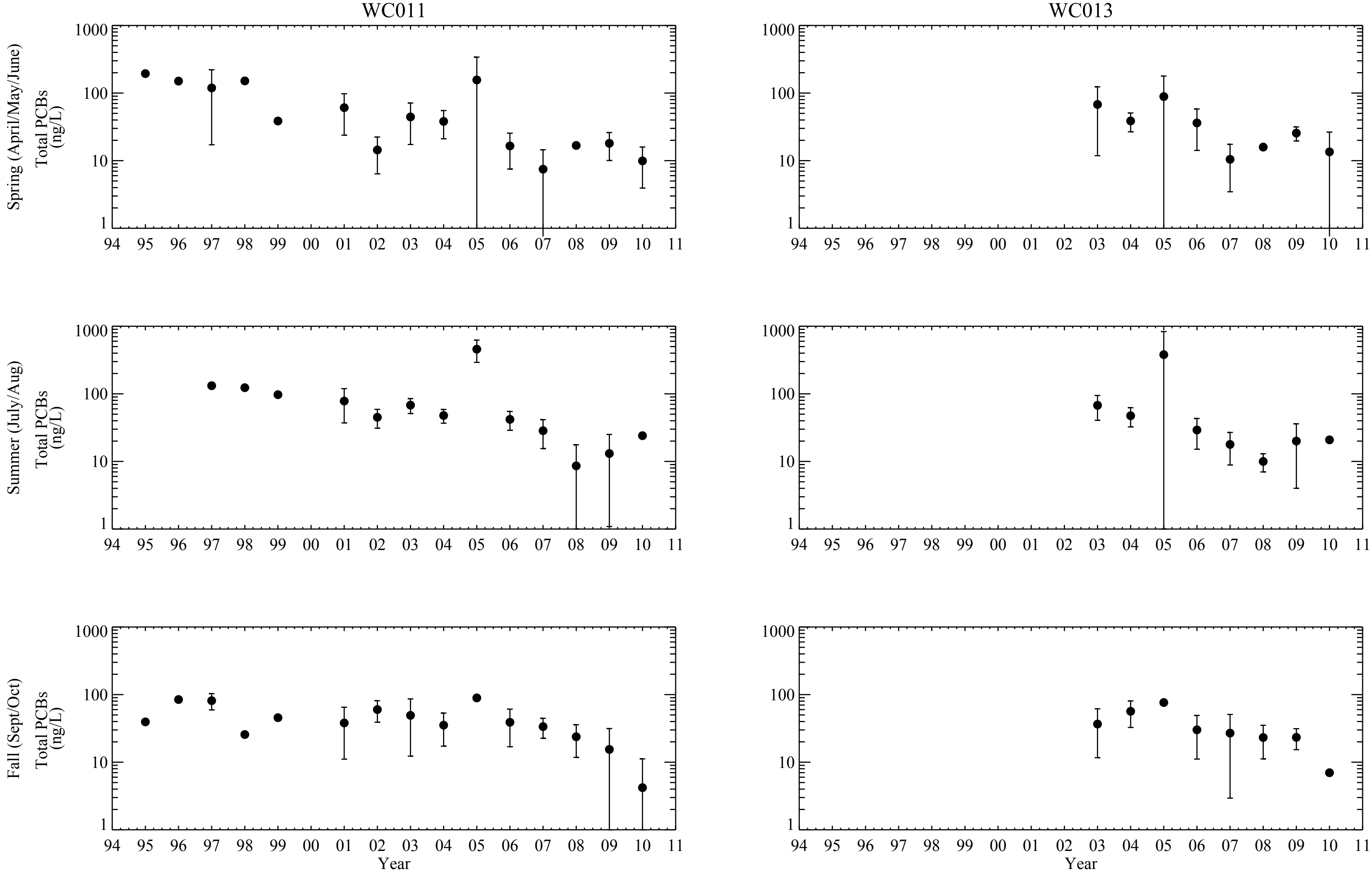


Figure 2-9b. Seasonal Average Water Column PCB Concentrations Measured During Non-Stratified Periods (WC011 and WC013)

Data represent samples collected when river flow was less than or equal to 2200 cfs.
1995 to 1999 data represent composite samples collected during non-stratified periods.
2000 to 2010 data represent surface samples collected at 0.2 times the total water depth to avoid any influence of stratification.
Error bars represent two standard errors of the mean; no error bars shown if sample count is fewer than three.
Duplicates averaged; data collected on same day averaged. Non-detects are plotted at 0.01 ng/L as open circles.
Data tables: riverflow_hist, water_bz, water_peak, water_iupac

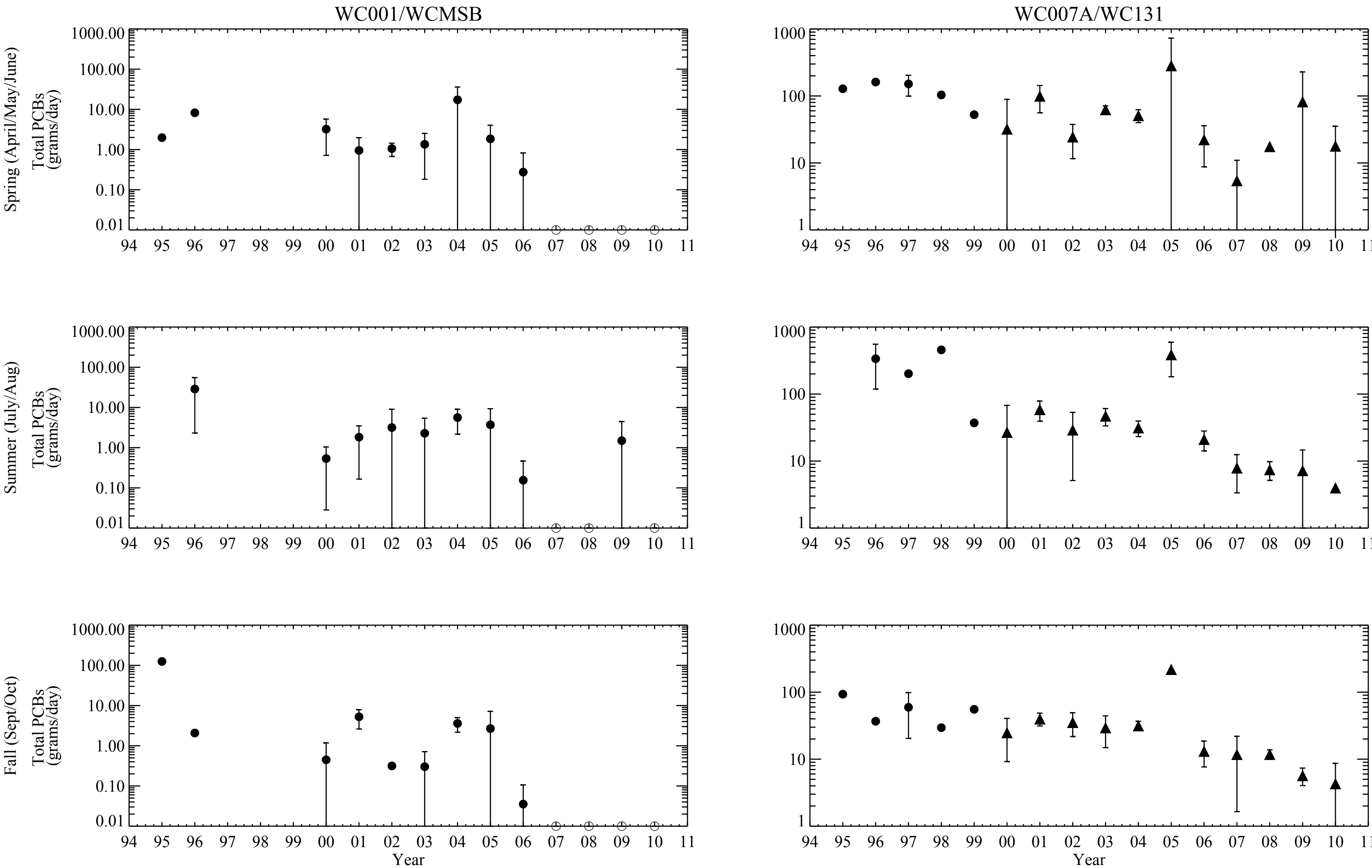


Figure 2-10a. Seasonal Average Water Column PCB Mass Fluxes Measured During Non-Stratified Periods (WC001/WCMSB and WC007A/WC131)

Data represent samples collected when river flow was less than or equal to 2200 cfs. Triangles represent surface samples collected at WC131.
1995 to 1999 data represent composite samples collected during non-stratified periods.
2000 to 2010 data represent surface samples collected at 0.2 times the total water depth to avoid any influence of stratification.
Error bars represent two standard errors of the mean; no error bars shown if sample count is fewer than three.
Duplicates averaged; data collected on same day averaged. Non-detects are plotted at 0.01 grams/day as open circles.
Data tables: riverflow_hist, water_bz, water_peak, water_iupac

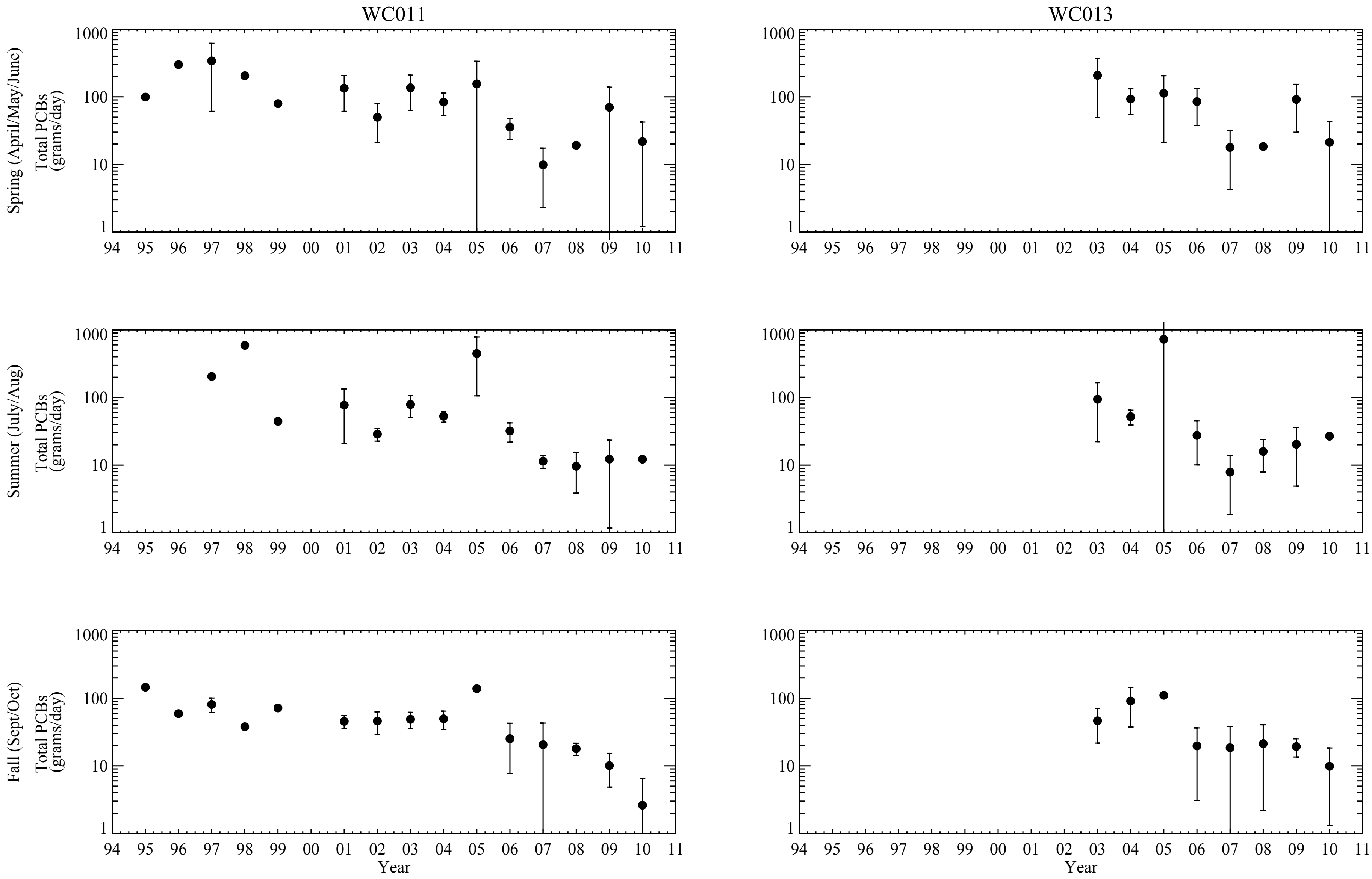
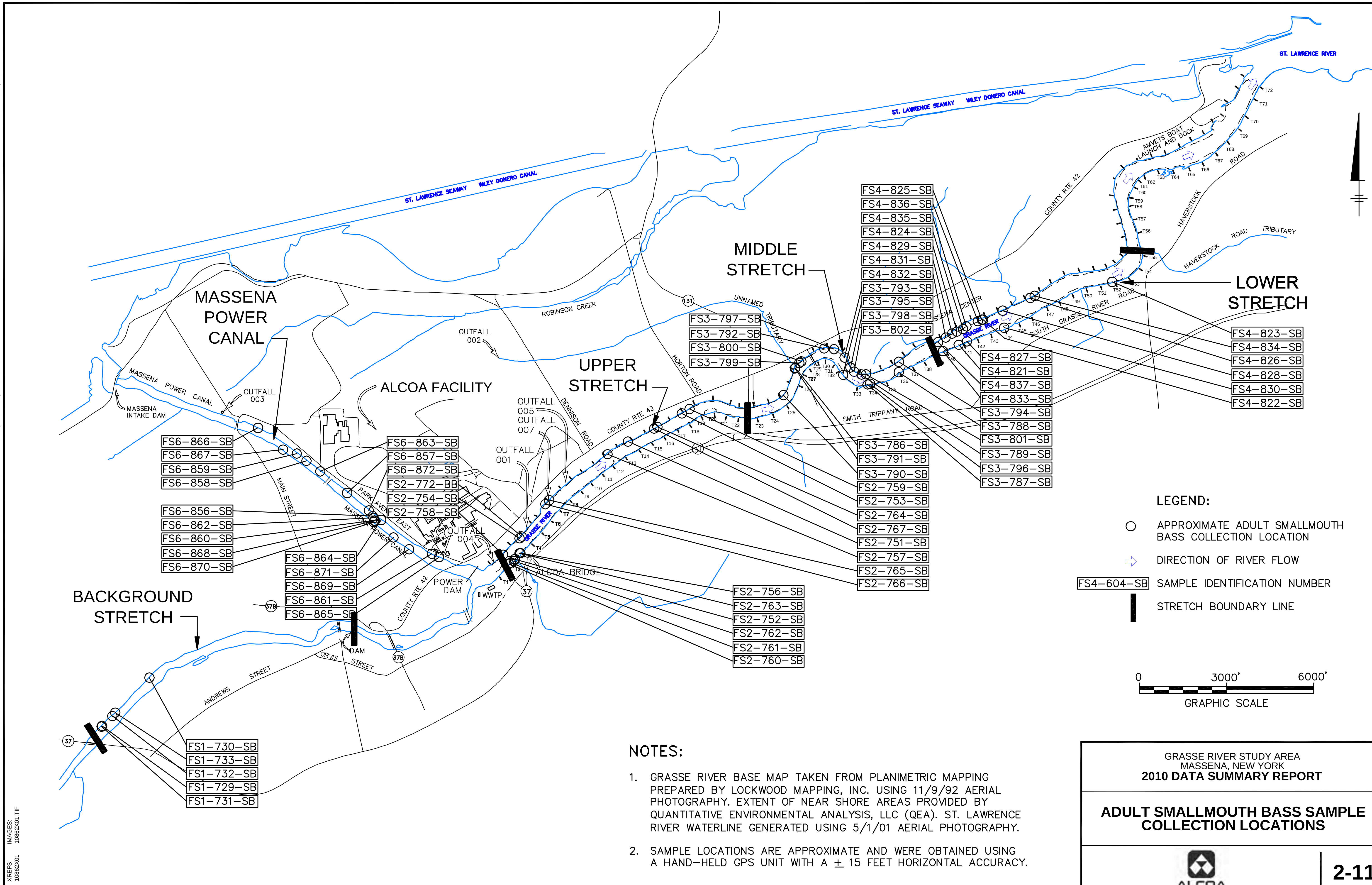


Figure 2-10b. Seasonal Average Water Column PCB Mass Fluxes Measured During Non-Stratified Periods (WC011 and WC013)

Data represent samples collected when river flow was less than or equal to 2200 cfs.
1995 to 1999 data represent composite samples collected during non-stratified periods.
2000 to 2010 data represent surface samples collected at 0.2 times the total water depth to avoid any influence of stratification.
Error bars represent two standard errors of the mean; no error bars shown if sample count is fewer than three.
Duplicates averaged; data collected on same day averaged.
Data tables: riverflow_hist, water_bz, water_peak, water_iupac



NOTES:

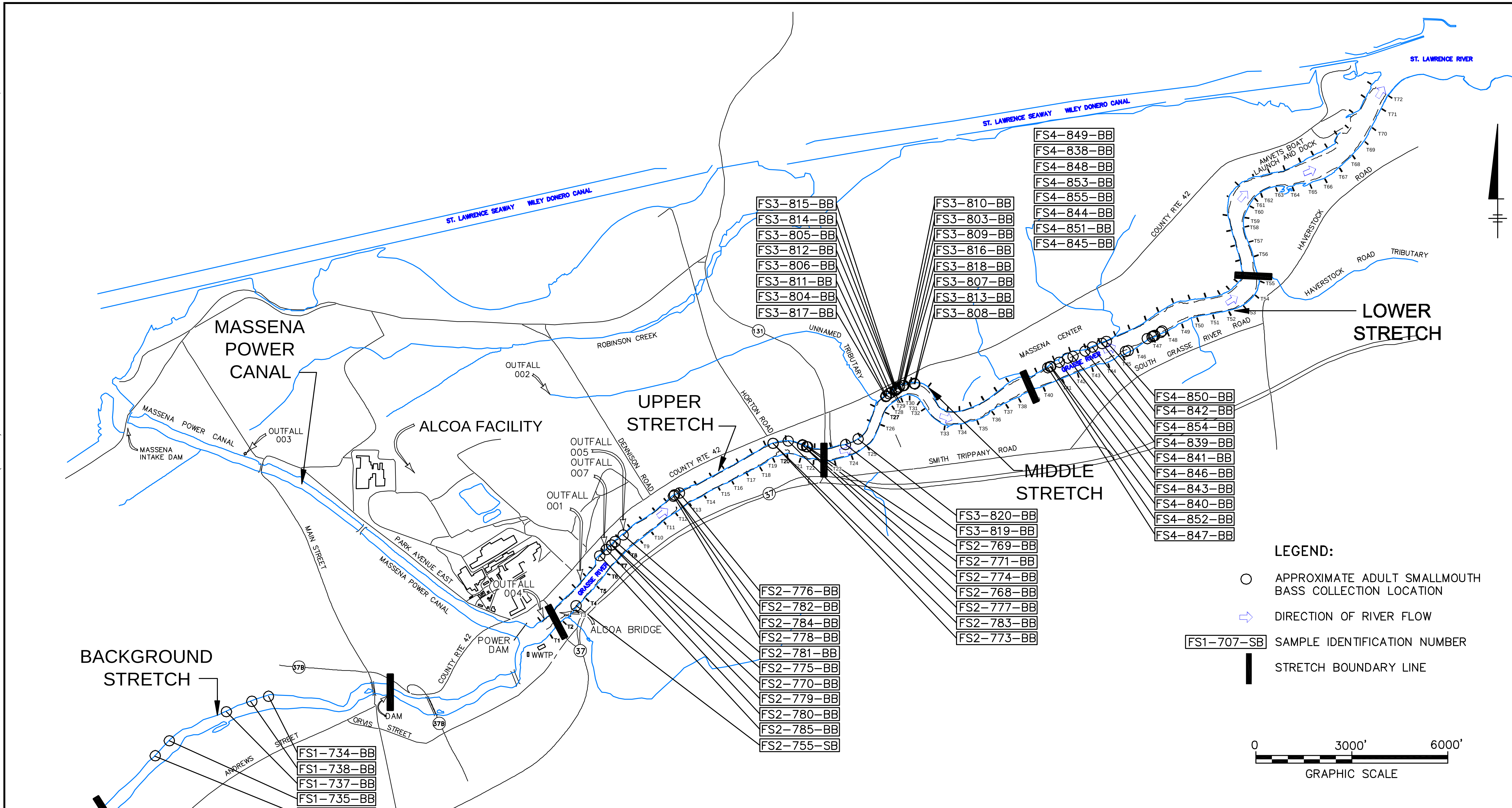
1. GRASSE RIVER BASE MAP TAKEN FROM PLANIMETRIC MAPPING PREPARED BY LOCKWOOD MAPPING, INC. USING 11/9/92 AERIAL PHOTOGRAPHY. EXTENT OF NEAR SHORE AREAS PROVIDED BY QUANTITATIVE ENVIRONMENTAL ANALYSIS, LLC (QEA). ST. LAWRENCE RIVER WATERLINE GENERATED USING 5/1/01 AERIAL PHOTOGRAPHY.
2. SAMPLE LOCATIONS ARE APPROXIMATE AND WERE OBTAINED USING A HAND-HELD GPS UNIT WITH A ± 15 FEET HORIZONTAL ACCURACY.

GRASSE RIVER STUDY AREA
MASSENA, NEW YORK
2010 DATA SUMMARY REPORT

ADULT SMALLMOUTH BASS SAMPLE COLLECTION LOCATIONS

ALCOA

2-11



NOTES:

1. GRASSE RIVER BASE MAP TAKEN FROM PLANIMETRIC MAPPING PREPARED BY LOCKWOOD MAPPING, INC. USING 11/9/92 AERIAL PHOTOGRAPHY. EXTENT OF NEAR SHORE AREAS PROVIDED BY QUANTITATIVE ENVIRONMENTAL ANALYSIS, LLC (QEA). ST. LAWRENCE RIVER WATERLINE GENERATED USING 5/1/01 AERIAL PHOTOGRAPHY.
2. SAMPLE LOCATIONS ARE APPROXIMATE AND WERE OBTAINED USING A HAND-HELD GPS UNIT WITH A ± 15 FEET HORIZONTAL ACCURACY.

GRASSE RIVER STUDY AREA
MASSENA, NEW YORK
2010 DATA SUMMARY REPORT

ADULT BROWN BULLHEAD SAMPLE COLLECTION LOCATIONS

ALCOA

2-12

CITY: SYRACUSE, NY DIV/GROUP: 141/ENVCAD DB: L.POSENAUER PIC: H.VANDEWALKER PM: H.VANDEWALKER TM: S.HILL LYR:ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0010862\0001\00003\DWG\2010DATA SUMMARY\10862B02.DWG LAYOUT: 2-12 SAVED: 5/11/2011 1:38 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: B-PDF PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 5/13/2011 9:04 AM BY: POSENAUER, LISA
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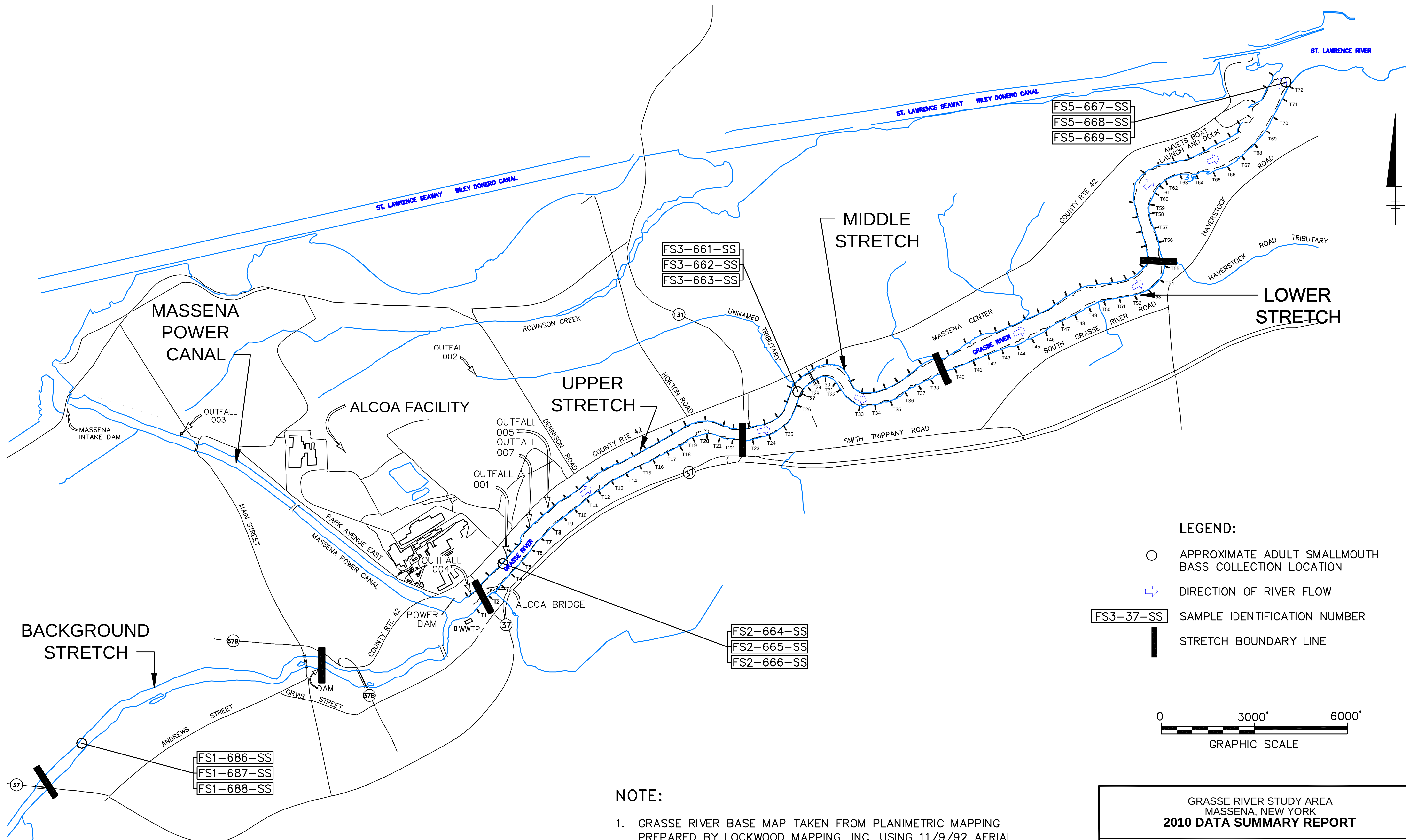


NOTE:

1. GRASSE RIVER BASE MAP TAKEN FROM PLANIMETRIC MAPPING PREPARED BY LOCKWOOD MAPPING, INC. USING 11/9/92 AERIAL PHOTOGRAPHY. EXTENT OF NEAR SHORE AREAS PROVIDED BY QUANTITATIVE ENVIRONMENTAL ANALYSIS, LLC (QEA). ST. LAWRENCE RIVER WATERLINE GENERATED USING 5/1/01 AERIAL PHOTOGRAPHY.

GRASSE RIVER STUDY AREA
MASSENA, NEW YORK
2010 DATA SUMMARY REPORT

YOUNG-OF-YEAR SPOTTAIL SHINER SAMPLE COLLECTION LOCATIONS

ALCOA

2-13

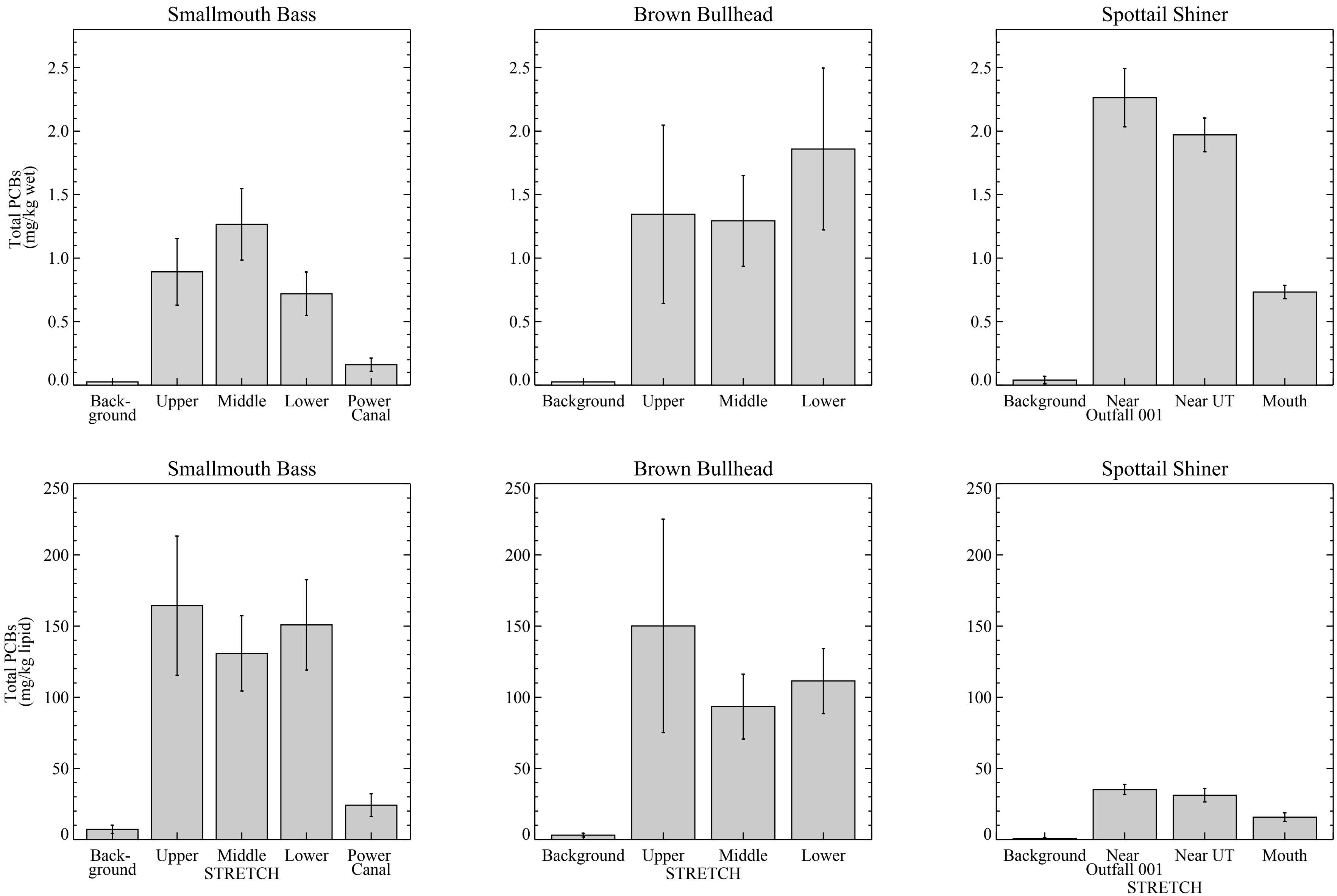


Figure 2-14. Average Aroclor-Based PCB Concentrations in Fish Collected in Fall 2010

Values represent arithmetic averages (+/- 2 standard errors). Non-detect values set to half the detection limit prior to averaging.

Locations where all samples were non-detect are shown as white bars.

Smallmouth bass and brown bullhead - adult individual fillets; spottail shiner - young-of-year whole body composites.

Data table: resfish_aro

ARC - C:\Jobs\ALCgra\Analysis\ResFish\IDL\fall10\resfish_barplot_by_survey.pro
Mon Nov 01 18:10:28 2010

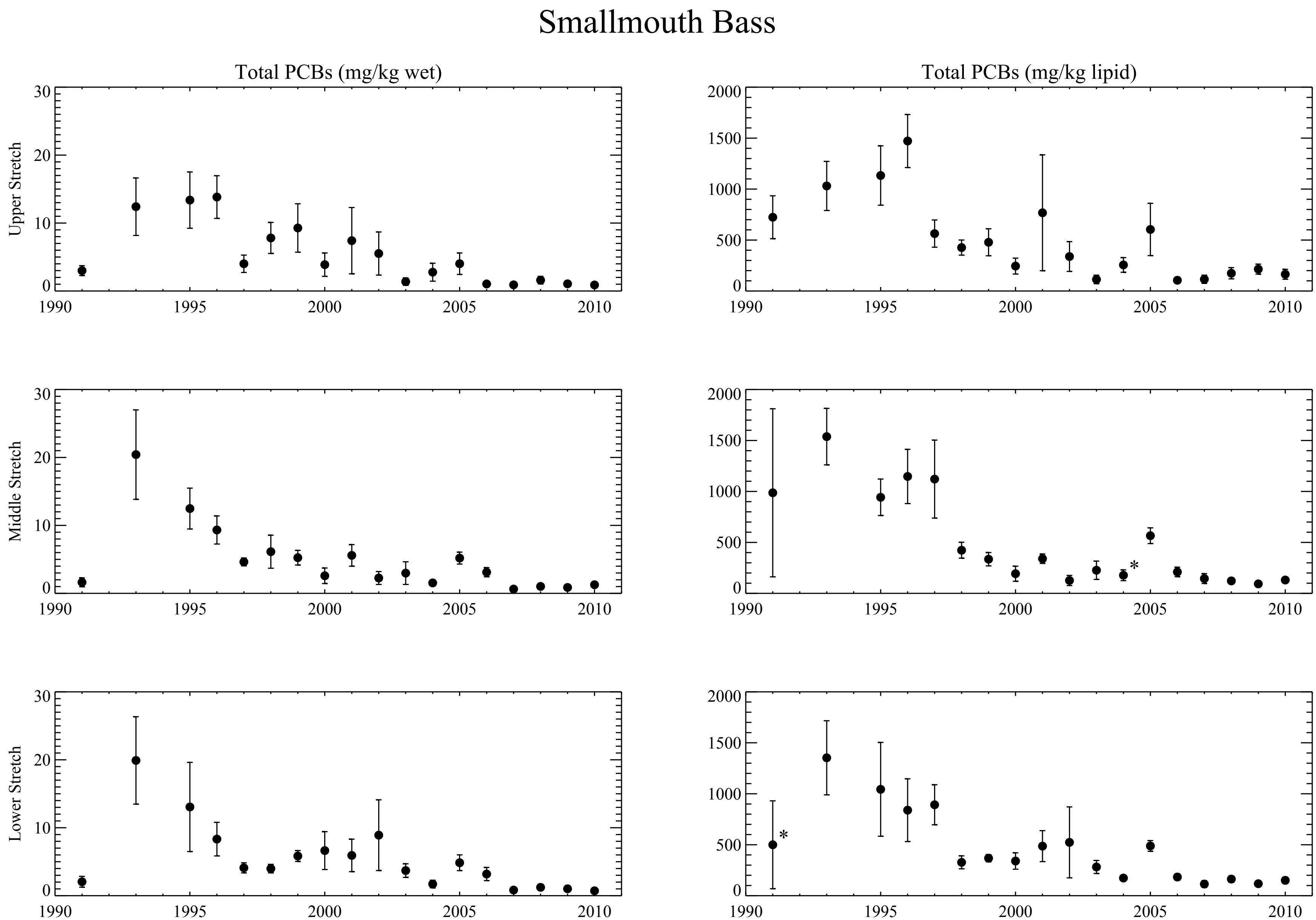


Figure 2-15. Average PCB Levels in Smallmouth Bass (1991 - 2010)
Data are arithmetic means +/- two standards errors of the mean.
Values below detection set to half the detection limit. If no detection limit reported, 0.05 mg/kg wet weight assumed.
Analytical methods employed by the laboratories have changed over time and thus, may affect comparability of these results.
**One 1991 and one 2004 sample were excluded due to unreasonably low lipid content (<0.1%).*

Data tables: resfish_aro

ARC - C:\Jobs\ALCgra\Analysis\ResFish\IDL\fall10\allspec_allloc_PCBwetlip.pro
Wed Apr 06 15:29:24 2011

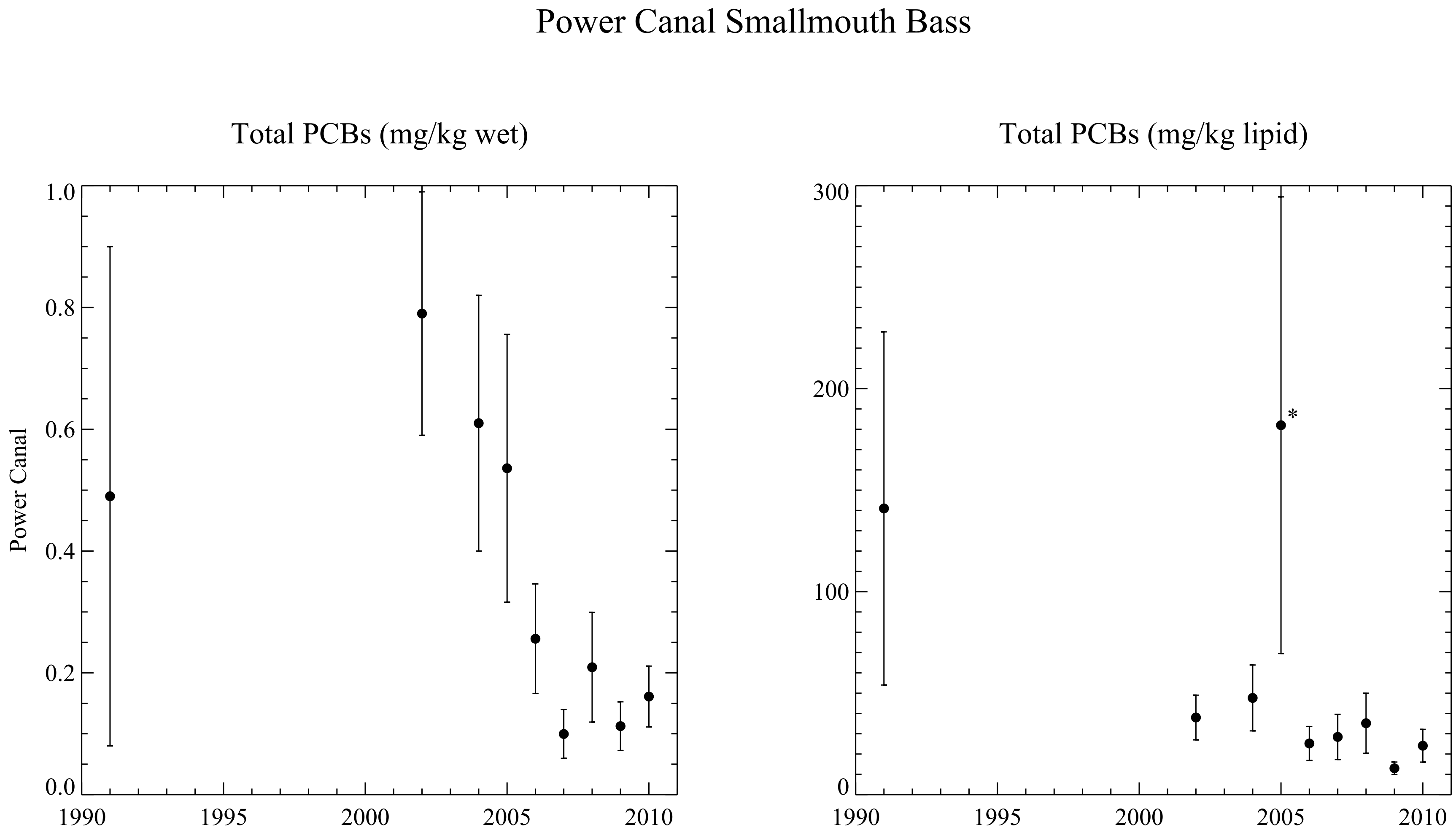


Figure 2-16. Average PCB Levels in Smallmouth Bass from the Power Canal
Data are arithmetic means +/- two standards errors of the mean.
Values below detection set to half the detection limit. If no detection limit reported, 0.05 mg/kg wet weight assumed.
Analytical methods employed by the laboratories have changed over time and thus, may affect comparability of these results.
**One 2005 sample was excluded due to unreasonably low lipid content (<0.1%).*

Data tables: resfish_aro

ARC - C:\Jobs\ALCgra\Analysis\ResFish\IDL\fall10\allspec_allloc_PCBwetlip.pro
Wed Apr 06 15:29:24 2011

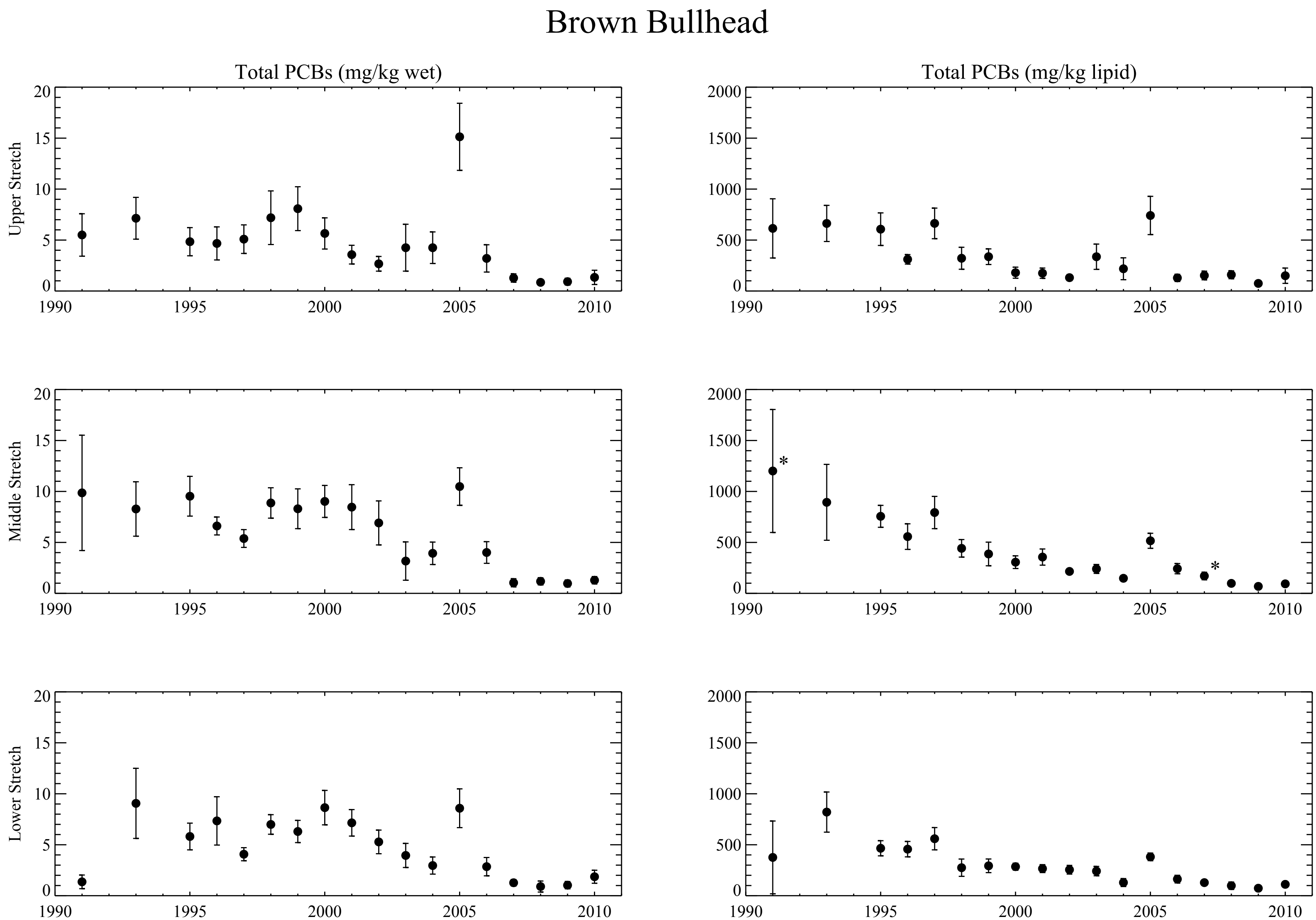


Figure 2-17. Average PCB Levels in Brown Bullhead (1991 - 2010)
Data are arithmetic means +/- two standards errors of the mean.
Values below detection set to half the detection limit. If no detection limit reported, 0.05 mg/kg wet weight assumed.
Analytical methods employed by the laboratories have changed over time and thus, may affect comparability of these results.
**One 1991 and one 2007 sample was excluded due to unreasonably low lipid content (<0.1%).*

Data tables: resfish_aro

ARC - C:\Jobs\ALCgra\Analysis\ResFish\IDL\fall10\allspec_allloc_PCBwetlip.pro
Wed Apr 06 15:29:24 2011

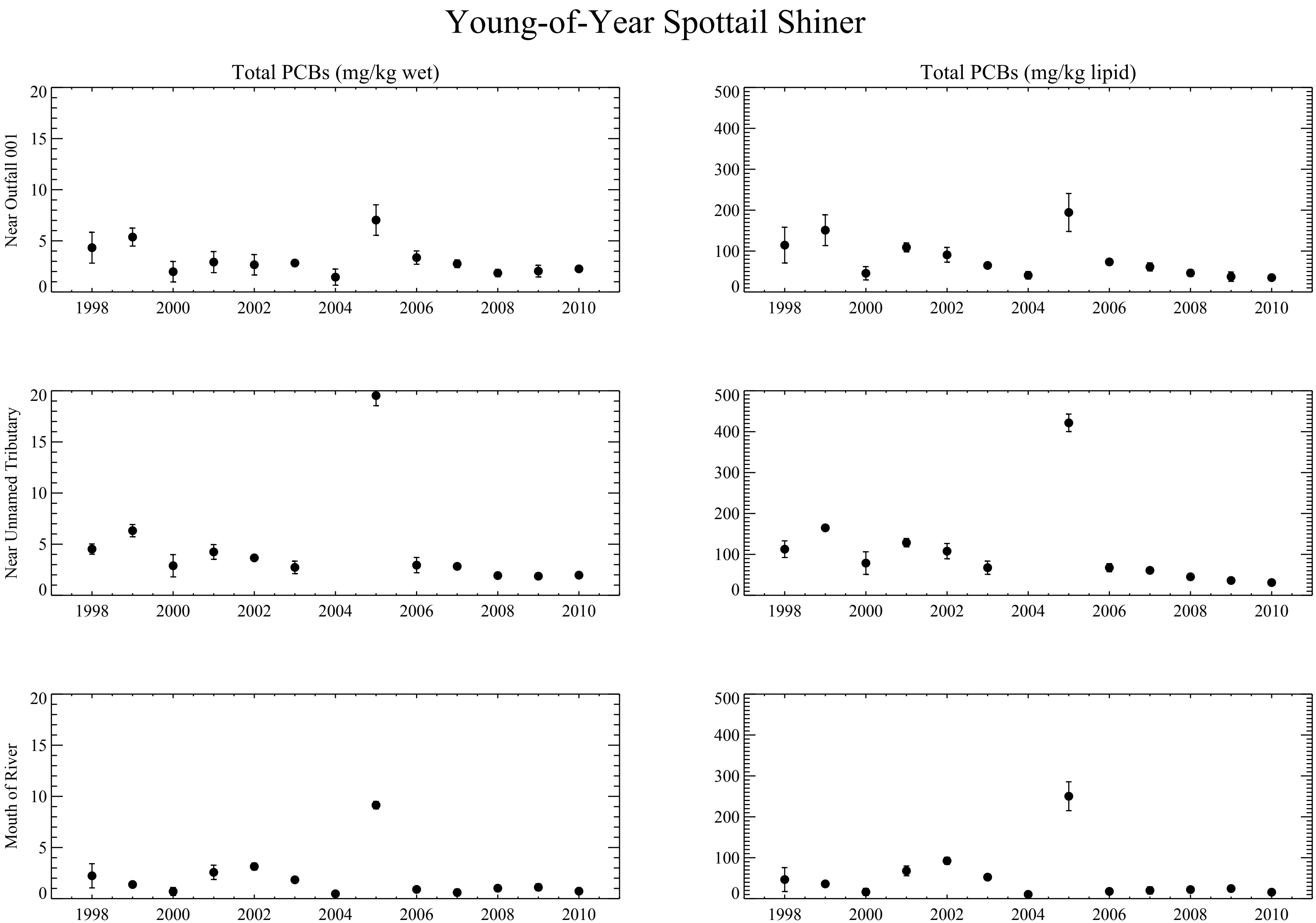
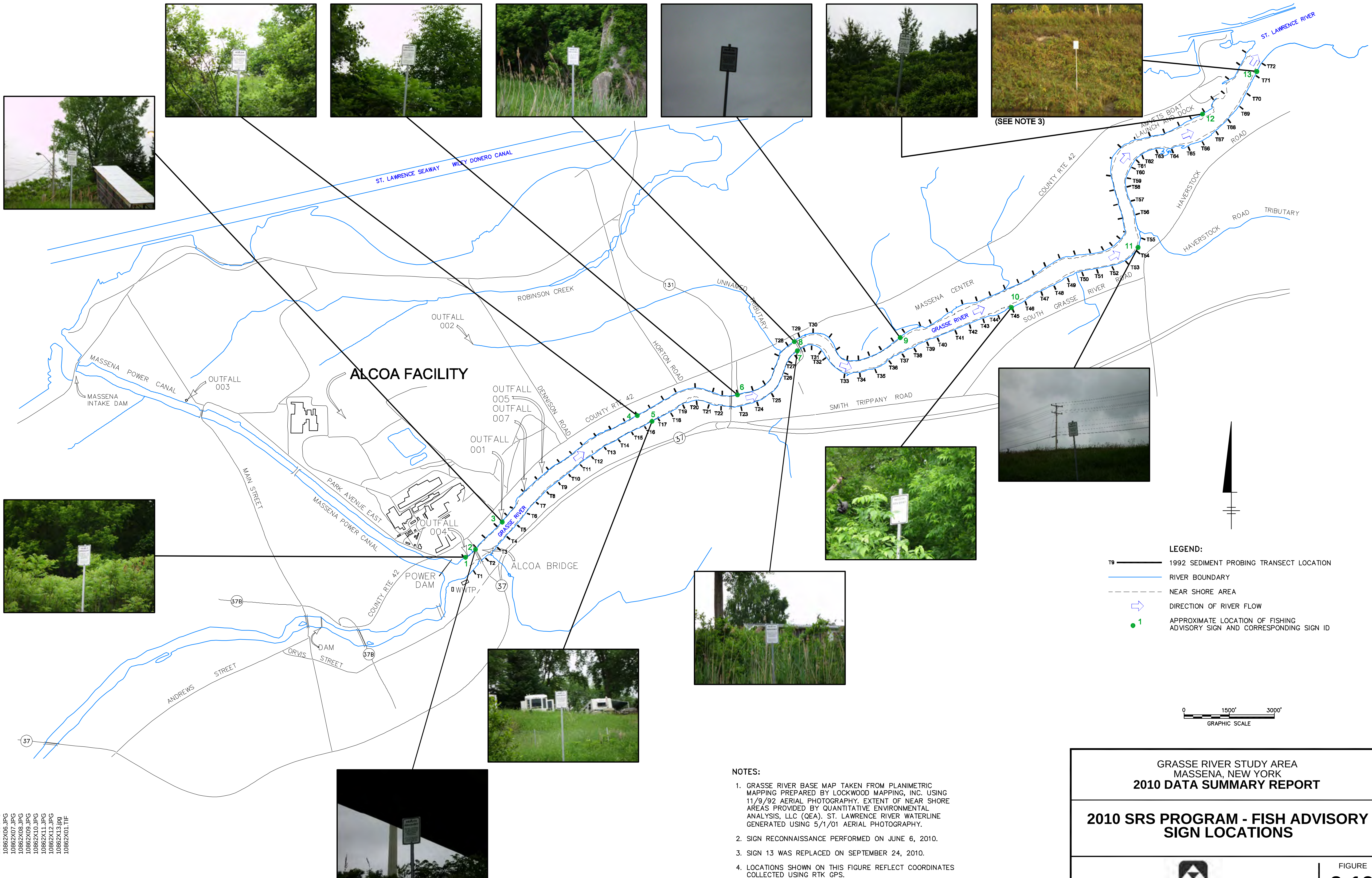


Figure 2-18. Average PCB Levels in Young-of-Year Spottail Shiner (1998 - 2010)
Data are arithmetic means +/- two standards errors of the mean.
Values below detection set to half the detection limit. If no detection limit reported, 0.05 mg/kg wet weight assumed.
Analytical methods employed by the laboratories have changed over time and thus, may affect comparability of these results.
Samples analyzed as whole body composites. Composite was considered as YOY if all lengths were <6.5 cm.

Data tables: resfish_aro

ARC - C:\Jobs\ALCgra\Analysis\ResFish\IDL\fall10\allspec_allloc_PCBwetlip.pro
Wed Apr 06 15:29:24 2011



NOTES:

1. GRASSE RIVER BASE MAP TAKEN FROM PLANIMETRIC MAPPING PREPARED BY LOCKWOOD MAPPING, INC. USING 11/9/92 AERIAL PHOTOGRAPHY. EXTENT OF NEAR SHORE AREAS PROVIDED BY QUANTITATIVE ENVIRONMENTAL ANALYSIS, LLC (QEA). ST. LAWRENCE RIVER WATERLINE GENERATED USING 5/1/01 AERIAL PHOTOGRAPHY.
2. SIGN RECONNAISSANCE PERFORMED ON JUNE 6, 2010.
3. SIGN 13 WAS REPLACED ON SEPTEMBER 24, 2010.
4. LOCATIONS SHOWN ON THIS FIGURE REFLECT COORDINATES COLLECTED USING RTK GPS.

GRASSE RIVER STUDY AREA
MASSENA, NEW YORK
2010 DATA SUMMARY REPORT

2010 SRS PROGRAM - FISH ADVISORY SIGN LOCATIONS

ALCOA

FIGURE
2-19

SECTION 3
2010-2011 RIVER ICE MONITORING

Ice monitoring activities were performed on the Grasse River during the 2010/2011 winter season. As with the previous year, the 2010/2011 monitoring was conducted in accordance with the modified monitoring program presented and discussed at the USEPA Technical Team meeting on December 18, 2008 and approved by USEPA in an email dated January 19, 2009. For the 2010/2011 winter season, the Grasse River experienced a routine propagation and melt-out with no evidence of ice jams or scouring. No additional work outside the planned monitoring program was required or performed.

This section includes a summary of information gathered throughout the 2010/2011 ice monitoring season, including an analysis of available data regarding the potential for an ice jam event during the natural ice breakup. Ice monitoring locations are presented in **Figure 3-1** and **Table 3-1**. **Figure 3-2** displays a profile of the typical water surface elevations along the 55-mile length of the river.

3.1 CLIMATOLOGICAL CONDITIONS

The climatological data used for this study were measured at Massena International Airport. The daily average temperatures during the winter of 2010/2011 are shown in **Figure 3-3**. A brief description of temperature fluctuations during the 2010/2011 winter season follows:

- December 2010: average air temperatures remained below freezing, resulting in the observation of initial ice cover on the lower Grasse River starting December 10, 2010;
- December 31, 2010 through January 2, 2011: average air temperatures rose to above freezing, resulting in some minor shoreline melting and thinning;
- January 2 through February 17, 2011: average air temperatures remained below freezing, allowing the ice cover to propagate;

- February 18, 2011: the average air temperature reached 44 degrees Fahrenheit, however this was a one-day thaw and therefore no significant change in the ice cover was observed;
- February 19 through March 4, 2011: average air temperatures remained below freezing, allowing the ice cover to propagate; and
- March 5 through March 22, 2011: average air temperatures were mostly above freezing with limited precipitation, resulting in a gradual melt-out of ice cover in the lower Grasse River.

Figure 3-4 provides a plot of daily total precipitation during the 2010/2011 winter season. Six precipitation events above 0.5 in. were recorded during the ice monitoring season, none of which occurred during the thermal melt-out period.

3.2 RIVER STAGE MONITORING

3.2.1 River Stage and Flow During Ice Formation

Provisional real-time stage height and flow (discharge) data for the USGS gaging station at Chase Mills, New York (#04265432) were downloaded for the period November 14, 2010 to March 26, 2011 from the USGS website [http://waterdata.usgs.gov/nwis/uv/?site_no=04265432]. These data, collected by USGS at 15 minute intervals, are shown in **Figure 3-5a**. Daily average stage height and flow for the same period as reported by USGS are shown in **Figure 3-5b**. Flow was not reported by USGS during periods of ice cover, due to potential inaccuracies associated with ice in the vicinity of the gage. As such, no flow readings were available from the Chase Mills gage from December 8, 2010 through March 6, 2011, although the stage height continued to be recorded and reported. All of the USGS data posted on the website and summarized in this report are provisional data subject to USGS review and potential modification.

A sustained ice cover was first observed on the lower Grasse River on December 10, 2010. The last flow readings at Chase Mills prior to this date were on December 7 when a daily average discharge of 1,022 cfs and a daily average stage height of 5.12 ft. were reported.

In May 2008, Alcoa installed a staff gage on the north channel pier of the Main Street Bridge (Location #9 in **Figure 3-1)** in downtown Massena, NY. The primary objective of this gage is to provide a secondary source of stage height and discharge estimation for the river at Massena, during the transition periods of freezeup and ice breakup when the USGS gage may not be reporting discharge. Alcoa intends to develop and refine a stage-discharge curve or "rating curve" for this gage over time, by correlating stage height at Main Street Bridge gage to discharge at the Chase Mills gage during periods where discharge is not affected by ice (see discussion in **Section 3.2.3**). On the freezeup date (i.e., December 10, 2010), the staff gage was partially obscured by an accumulation of snow/ice, but the water level was estimated at 0.6 ft. Based on the most recent rating curve for the Main Street Bridge gage (see **Figure 3-8**), a gage reading of 0.6 ft. correlates to a flow of 2,334 cfs.

In consideration of the discharge and stage height trends at the Chase Mills gage (**Figures 3-5a** and **3-5b)**, and the stage height readings from the Main Street Bridge gage discussed above, the discharge at the time of lower river freezeup on December 10, 2010 is estimated at 2,300 cfs. After December 7, 2010 when the USGS stopped reporting flow from the Chase Mills gage, the reported Chase Mills stage heights displayed an upward trend that continued through observed freezeup. Based on this upward trend, the estimated discharge of 2,300 cfs derived from the Main Street Bridge gage reading on December 10, 2010 is reasonable.

Additional stage height data were collected from the staff gage at the Alcoa West Plant's Outfall 001 in the lower Grasse River. Outfall 001 is located approximately 1,250 ft. downstream of the Alcoa Bridge (Location #7 in **Figure 3-1**). The stage height information is automatically recorded from this bubbler-type level sensor at five-minute intervals and stored by Alcoa for retrieval. On October 20, 2010 a representative from Burgh-Schoenenberger performed the annual inspection of the level sensor and recorder at Outfall 001. The gage was re-calibrated to report 0.0 ft. at a water surface elevation of 150.00 ft. United States Lake Survey

(USLS) 1935. The readings from the gage were then checked through a series of tape down measurements taken on October 26, 2010 and April 5, 20102011, which verified its proper calibration. No further adjustments were made to the gage during the 2010/2011 winter season. Average daily stage height readings at the Outfall 001 gage are shown in **Figure 3-6** for November 1, 2010 to March 31, 2011. The average daily stage height at the Outfall 001 gage on the day of observed freezeup (December 10, 2010) was 5.03 ft.

3.2.2 River Stage and Flow During Ice Breakup

To evaluate river stage during the spring ice breakup/melt-out period, the provisional real-time stage height and flow data for the USGS gaging station at Chase Mills were plotted for the period of March 12 to March 24, 2011 (**Figure 3-7**). Daily average flows and stage heights during the five-day observed melt-out period in the lower Grasse River (March 17 through 22, 2011) are briefly summarized below:

- March 17, 2011: thermal melt-out begins with an average stage height of 5.93 ft. and an average flow rate of 3,478 cfs;
- March 19, 2011: stage height and flow rate peak at an average daily of 6.69 ft. and 6,364 cfs, respectively; and
- March 22, 2011: average stage height and flow rate drop to 5.98 ft. and 3,652 cfs, respectively.

Stage height readings at Alcoa's Outfall 001 staff gage are also shown in **Figure 3-7**. The average stage height during the thermal melt-out period was approximately 5.68 ft. As in previous years, daily fluctuations Daily fluctuations that are associated with the release of water in the St. Lawrence River from power production are observed.

Relative river stage height data from the Main Street Bridge staff gage were collected prior to and during the thermal melt-out period (**Table 3-2**). The measurement taken on March 17, 2011 at the beginning of the thermal melt-out was 1.05 ft. The highest water level was estimated at 1.74 ft. on March 21, 2011. Based on the most recent rating curve for the Main

Street Bridge gage (see **Figure 3-8**), the correlating flows for the stage height measurements are as follows:

- March 17, 2011: 3,183 cfs;
- March 18, 2011: 4,258 cfs;
- March 21, 2011: 4,485 cfs; and
- March 22, 2011: 3,673 cfs.

3.2.3 Discharge Correlation with Main Street Bridge Staff Gage

Alcoa installed the gage at the Main Street Bridge in May 2008 with the intent of obtaining additional stage and discharge information during the freezeup and breakup periods. The discharge during these periods is one of the parameters used to assess the likelihood of a mechanical ice breakup and the potential formation of an ice jam in the lower Grasse River.

Calibration of the gage requires that periodic measurements of stage levels are recorded when correlating discharge data are available at the USGS Chase Mills gage. Because of the height at which the Main Street gage is affixed to the bridge pier, correlating data must be from above-normal river discharge conditions, generally associated with rainfall events. Water levels do not typically reach the base elevation of the Main Street Bridge gage until a discharge of approximately 1,300 cfs or greater is reached. The historical long-term average flow for the Grasse River is 1,100 cfs.

The current rating curve is provided as **Figure 3-8**, and includes an inset table of the gage readings collected since December 2008, along with the correlating stage height and discharge from the USGS Chase Mills gage. Although the two gages are approximately 11 miles apart, there are no major tributaries to the Grasse River between Chase Mills and Massena. Based on wave celerity, the approximate lag time of stage change between the gages is believed to be a few hours, but this has not been formally calculated. For purposes of establishing the rating curve, the Main Street Bridge gage height has been plotted versus Chase Mills discharge based on the time of measurement at Main Street (i.e., no lag time). A linear best fit trend line has been drawn using standard functions in Microsoft Excel. Additional data points are needed for correlation above 4,000 cfs.

3.3 ICE THICKNESS MEASUREMENTS AND SIMULATION

The 2010/2011 ice monitoring program included one ice thickness measurement event, performed on March 8, 2011. A computer simulation model was utilized to forecast ice formation and decay during the winter 2010/2011 period. The ice thickness measurements and ice thickness simulations are discussed in the following subsections.

3.3.1 Ice Thickness Measurements

Ice thickness measurements were collected at the Route 131 Bridge, Outfall 001 and Route 37 Bridge locations on March 8, 2011 **(**see **Figure 3-1).** A snow and/or slush cover was observed at all three locations. A motorized auger was used to bore 8-in. diameter holes through the ice. These locations were 20 ft. off the north shore, midway to the center of the channel and at the center of the channel. A tape measure probe was used to hook onto the bottom of the ice cover and measure upward to the top of the borehole. The total depth of material was visually differentiated between solid ice and porous snow cover or slush. The ice thickness measurements and calculated averages are summarized in **Table 3-3**. The overall average ice thickness considering all six boreholes measured in the lower Grasse River was 14.8 in.

3.3.2 Ice Thickness Simulations

Mechanical ice breakup in the upper Grasse River can lead to ice jams in the lower river if an intact ice cover of sufficient strength exists in the lower river that would prevent the continued movement of ice floes entering from upstream. As discussed in the hindcasting analysis provided in Appendix N of the *Draft Addendum to the Comprehensive Characterization of the Lower Grasse River* (Alcoa, April 2009), mechanical ice breakup and ice jams may occur in the lower Grasse River when the discharge increase from freezeup to breakup exceeds about

3,500 cfs and the ice at the time of breakup is thicker than approximately 15 in. Reaching these conditions does not necessarily mean that ice jams sufficient to disturb sediments would form, but these conditions are considered to be the threshold of concern in relation to an ice jam event that can result in a significant disturbance of the bottom sediments, as was observed during the 2003 ice jam event. Forecasting of air temperature, rainfall, and ice thickness in a given year can help predict whether these threshold conditions may be met during the breakup period.

During the winter of 2010/2011, the growth and decay of the ice cover thickness were simulated using actual and forecasted air temperature data from Massena International Airport. Thickness simulations were started on December 10, 2010 and continued through April 4, 2011. A 15-day air temperature forecast was periodically uploaded into the model to generate a graph showing predicted ice cover thickness over time. As the winter progressed, the "predicted thickness" portion of the curve was replaced by a "simulated thickness," based on the measured air temperatures.

Figure 3-9 graphs the simulated ice thickness over the winter based on actual daily average air temperatures. For comparison, the measured maximum and minimum thickness values and calculated average of the lower Grasse River for the ice thickness measurement event on March 8 are also shown in **Figure 3-9**. **Figure 3-10** provides a closer look at the results of the ice thickness simulation from February 19, 2011 through the decay phase ending April 4, 2011.

After the initial formation of an intact ice cover on December 10, 2010, the maximum simulated thickness of 25.3 in. was reached on March 7, 2011. For comparison, the maximum simulated thicknesses for 2005 through 2010 ranged from 20 to 27 in., with an average of 22.9 in. On March 8, 2011, the average thickness measured in the lower Grasse River was 14.8 in. and the simulated ice thickness was 25.2 in. (a difference of 10.4 in.). The simulation indicates ice thickness was sustained near its maximum for a very short time, followed by a period of slight ice decay and reformation as temperatures fluctuated, ultimately decreasing to a thickness of approximately 17 in. on March 30, 2011. A very a rapid decline in ice thickness was then predicted to occur, decreasing to 0 in. by April 4, 2011. The simulation results are inconsistent with the visual observations, which documented a full melt-out by March 22, 2011. A significant snow cover on the ice for much of the winter, which insulates the ice and retards ice formation, is the likely source of the discrepancy between simulation and actual results/observations.

3.4 MONITORING OF RIVER ICE BREAKUP

Starting March 5, 2011, the average daily temperatures were generally above freezing, which resulted in the gradual melt-out observed in the lower Grasse River. For purposes of discussion in this section, the breakup or melt-out period has been designated as March 17 through March 22, 2011. Select photographs during the ice breakup period are presented in **Figure 3-11,** and the comprehensive photographic record for the winter is provided in **Appendix B**. The USGS began reporting discharge at the Chase Mills gage on March 7, 2011, which is an indication that ice had moved out from that portion of the upper river. Based on previous monitoring activities, the Grasse River ice cover typically breaks up from upstream to downstream (south to north). Baseline observations were made on March 17, 2011 due to anticipated higher temperatures as well as simulated ice thickness model results. Observations by the field crews are summarized below for the March 17 through 22, 2011 timeframe during which the thermal melt-out occurred.

March 17, 2011: 7:00AM through 8:00AM – Intact ice cover was observed in the vicinity of the Route 37 Bridge with shore melt beginning upstream of the bridge. In the vicinity of the Alcoa Bridge holes had formed downstream of the bridge and there was open water along the shore from Outfall 004 downstream to Outfall 001. Also there was an accumulation of ice pieces in front of the power dam. The ice in the vicinity of the Capping Pilot Study area was intact with no evidence of shore melt. The ice both upstream and downstream of the Route 131 Bridge showed evidence of pitting and there were holes formed upstream of the bridge. The ice in the vicinity of Haverstock Road was intact both upstream and downstream with no evidence of shore melt. Snow cover was gone from all locations.

March 21, 2011: 10:30AM through 11:30AM – Primarily open water was observed from the Route 37 Bridge and downstream with some small areas of thin shorefast ice particularly near the Route 131 Bridge. An accumulation of small ice floes was observed in the vicinity of the Capping Pilot Study Area. Minimal ice cover was observed along the south shore at Haverstock Road, with open water immediately upstream and downstream.

March 22, 2011: 2:00 P.M – The entire lower river is observed as clear of ice with exception of shorefast ice at Haverstock Road.

In order to further document river conditions, an aerial inspection was conducted by Andy Tuthill of the U.S. Army Corps of Engineers Cold Regions Research and Engineering Laboratory (CRREL) on March 20, 2011. A brief memorandum with figures and oblique aerial photographs from the March 20, 2011 aerial inspection is provided in **Appendix B**. The river below the Alcoa Bridge was mostly covered but the ice looked thin and deteriorated. Similar conditions existed from the Route 37 Bridge up to the foot of the Louisville Rapids where a small jam remained. The river was 99% open further upstream from Louisville to Canton.

The breakup conditions, as described above and viewed through photographs, indicated that a thermal melt-out occurred without any significant potential for an ice jam that would produce a bed scouring event.

3.5 SUMMARY AND CONCLUSIONS

Visual observations were made from various locations long the Grasse River during the 2010/2011 winter season, and a photographic record was developed (**Appendix B**). The lower Grasse River below the Alcoa Bridge (Location #7 in **Figure 3-1**) was fully covered with ice by December 10, 2010. River flow at the time of freezeup was estimated at 2,300 cfs.

Consistent ice cover remained through early March 2010, despite two brief periods of above-freezing temperatures in January and February 2011. The growth and decay of the ice cover was numerically simulated during the 2010/2011 winter season using a model developed by Clarkson University. The model predicted a maximum thickness of 25.3 in. by March 7, 2011, with a complete melt-out by April 4, 2011 (**Figure 3-10**). At the start of the observed thermal melt-out period on March 17, 2011, thickness was simulated as 14.5 in., but was predicted to rapidly decline thereafter. Ice thickness measurements collected on March 8, 2011 provided an average ice cover thickness of 14.8 in. in the lower Grasse River. The measured thickness was approximately 10.4 in. lower than predicted by the computer model. A significant snow cover on the ice for much of the winter, which insulates the ice and retards ice formation, is the likely source of the discrepancy between simulation and actual results/observations.

The Grasse River experienced a gradual melt-out beginning in mid-March 2011. Based on the field observations, the breakup or melt-out period was designated as March 17 - 22, 2011. No significant precipitation events occurred during this timeframe (**Figure 3-4**). During the aerial inspection conducted on March 20, 2011 (**Appendix B**), it was observed that the upper river was primarily free of ice upstream of the Louisville Bridge. In general, ice cover observed in the lower river was highly deteriorated and had formed several stretches of open water. The USGS reported daily average flow rates between 3,479 and 6,364 cfs during the breakup period (**Figure 3-5b**). Using the highest of these values (6,364 cfs), the flow differential above the estimated freezeup discharge (2,300 cfs) is 4,064 cfs. Based on the ice thickness measurements and river flow differential between freezeup and breakup, the threshold conditions for a mechanical ice breakup and potentially significant jam (a differential of 3,500 cfs between breakup and freezeup, and an ice cover in excess of 15 in. at breakup) were not met.

Field crews did not observe movement of ice floes from the upper river into the lower river during the thermal melt-out period. The gage at Outfall 001 showed a gradual increase then decrease in stage height during the March 17-22 timeframe (**Figure 3-7**), but no sharp spikes in river stage that would indicate an ice jam. Based on the visual observations and supporting data on stage height, river flow, air temperature, precipitation and ice thickness measurements, the March 2011 breakup can be characterized as a thermal melt-out that did not create ice jam conditions for the lower Grasse River.

Table 3-1.
Ice Monitoring Locations

2010 Data Summary Report
Grasse River Study Area, Massena, New York

Location Number	Ice Monitoring Location[1]	Road Designation	Approximate 1992 Sediment Probing Transect Number[2]
1	AmVets Property	---	66
2	Haverstock Road	---	54
3	Massena Center	---	28
4	Route 131 Bridge	Route 131	22
5	Capping Pilot Study Area	---	16
6	Outfall 001	---	5
7	Alcoa Bridge	Alcoa Road	2
8	Parker Street Bridge	Route 37B	---
9	Main Street Bridge	Route 420	---
10	Route 37 Bridge	Route 37	---
11	Massena Rod and Gun Club	---	---
12	Louisville Bridge	Route 39	---
13	Chase Mills Bridge, USGS Gage	Route 36	---
14	Chamberlain Corners Bridge	Route 44	---
15	Madrid Bridge	Route 345	---

Notes:
1. Shaded locations were designated for use in 2010/2011 monitoring program.
2. Refer to **Figure 2-1** for transect locations.

Table 3-2.
Stage Height Measurements from Main Street Bridge Staff Gage
Winter 2010/2011

2010 Data Summary Report
Grasse River Study Area, Massena, New York

Date	Time	Gage Height (ft) [1,2]
12/10/2010	11:40 AM	0.6
3/9/2011	2:40 PM	1.7
3/10/2011	1:50 PM	1.38
3/11/2011	9:30 AM	1.4
3/14/2011	1:16 PM	2.1
3/15/2011	1:10 PM	1.5
3/16/2011	1:25 PM	1.2
3/17/2011	7:45 AM	1.05
3/18/2011	12:50 PM	1.62
3/21/2011	10:50 AM	1.74
3/22/2011	2:10 PM	1.31

Notes:
1. All measurements taken from the staff gage installed in the north channel of the Grasse River at Main Street Bridge in Massena, NY.
2. Base elevation (0.0) for the gage is 176.25 ft NAVD 1988. (176.67 ft NGVD 1929)

Table 3-3.
Ice Thickness Measurements

2010 Data Summary Report
Grasse River Study Area, Massena, New York

Borehole [1]	Distance from north shore (ft)	Snow/Slush Depth (in)	Total Ice (in)	White Ice (in)	Black Ice (in)
Location 10 (Route 37 Bridge)					
1	20	6.5	16	0-6[4]	12-22
2	90	5.5	17	0-9.5	9.5-17
3	180	6	15	0-8	8-15
Average			16		
Lower Grasse River Location 4 (Route 131 Bridge)					
1	20	2	17.5	0-8	8-17.5
2	90	5.5	11	0-6	6-11
3	180	7	13	0-9.5	9.5-13
Average			13.8		
Lower Grasse River Location 6 (Outfall 001)					
1	20	5.5	19	0-11	11-19
2	90	3	14.5	0-1, 5-10[2]	10-16
3	180	2.5	14	0-1, 2-11[3]	11-16
Average			15.8		
Lower River Average			**14.8**		

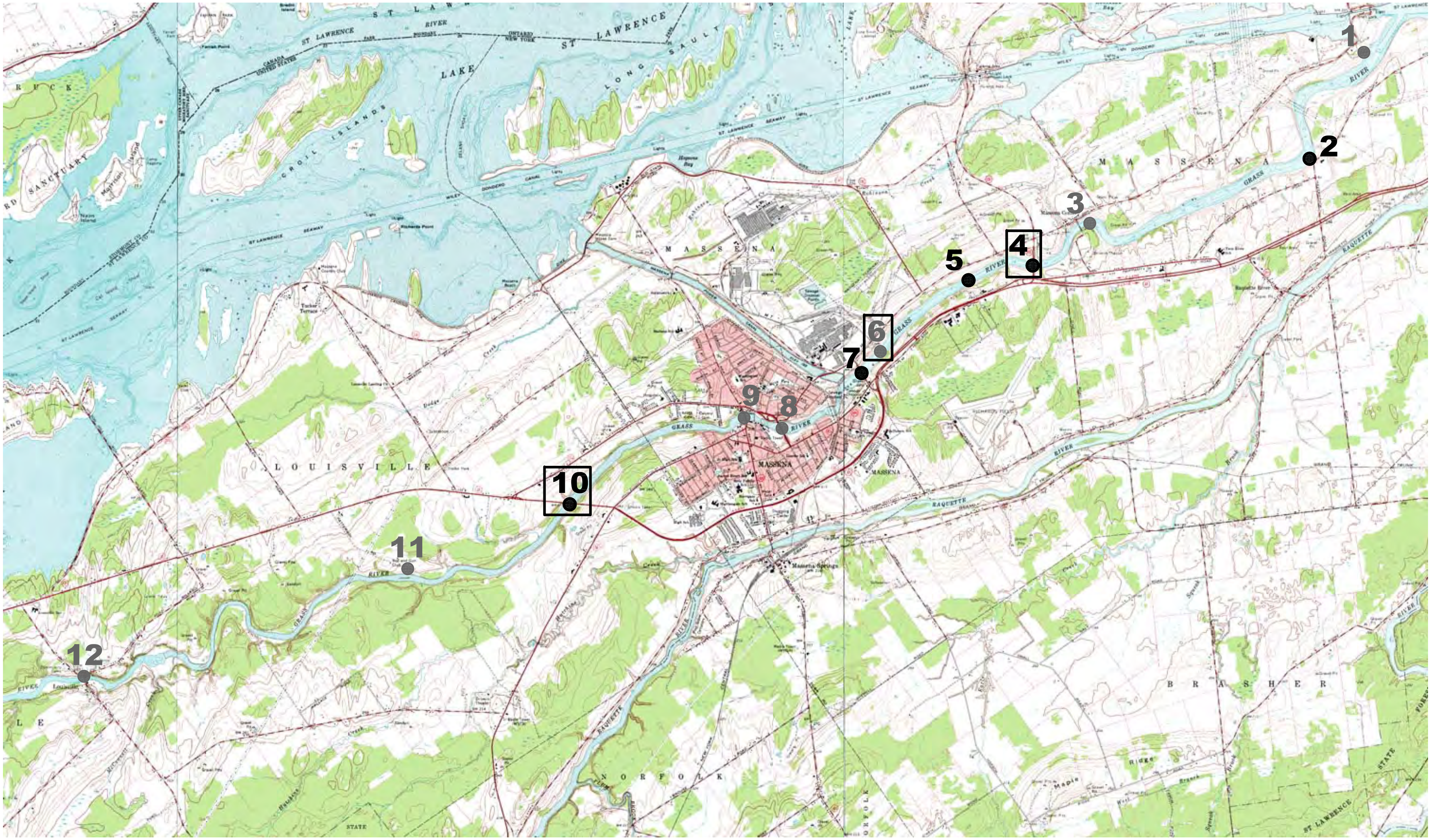
Notes:

1. All ice thickness measurements were collected on March 8, 2011.

2.This location had a water filled pocket from 6 - 12 inches.

3.This location had a water filled pocket from 1 - 2 inches.

4.This location had a water filled pocket from 6 - 12 inches.



KEY:

8 ● FORMER ICE MONITORING LOCATION

7 ● CURRENT ICE MONITORING LOCATION

4 ● ICE THICKNESS LOCATION

GRASSE RIVER STUDY AREA
MASSENA, NEW YORK

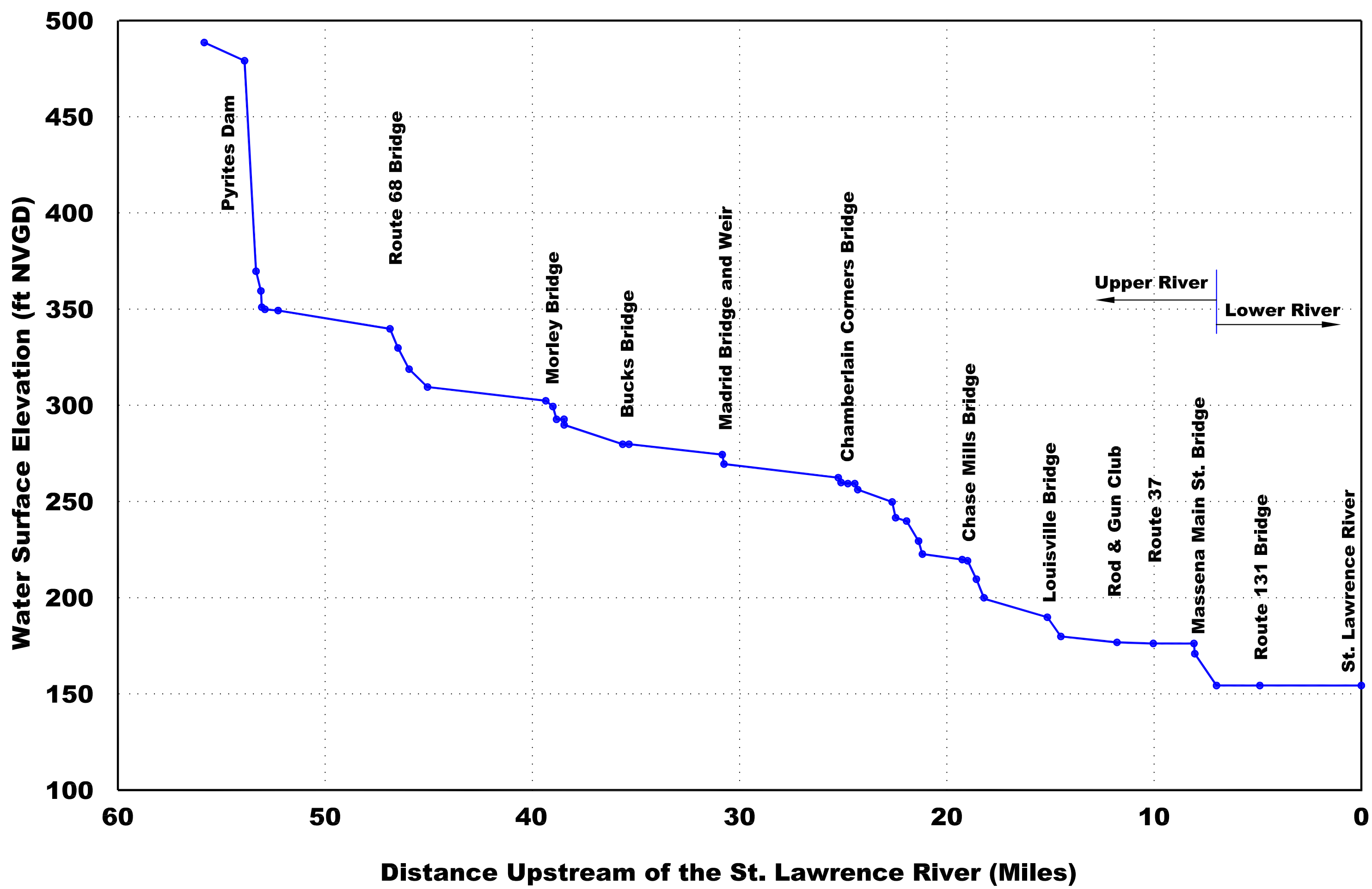
2010/2011 GRASSE RIVER ICE MONITORING LOCATIONS

ALCOA

FIGURE

3-1

L:\ALCOA\Massena West\Grasse River\ICE MONITORING–GRASSE\DWG\ ice monitoring–2009–2010 03/01/11 06:59 topotj



Note:

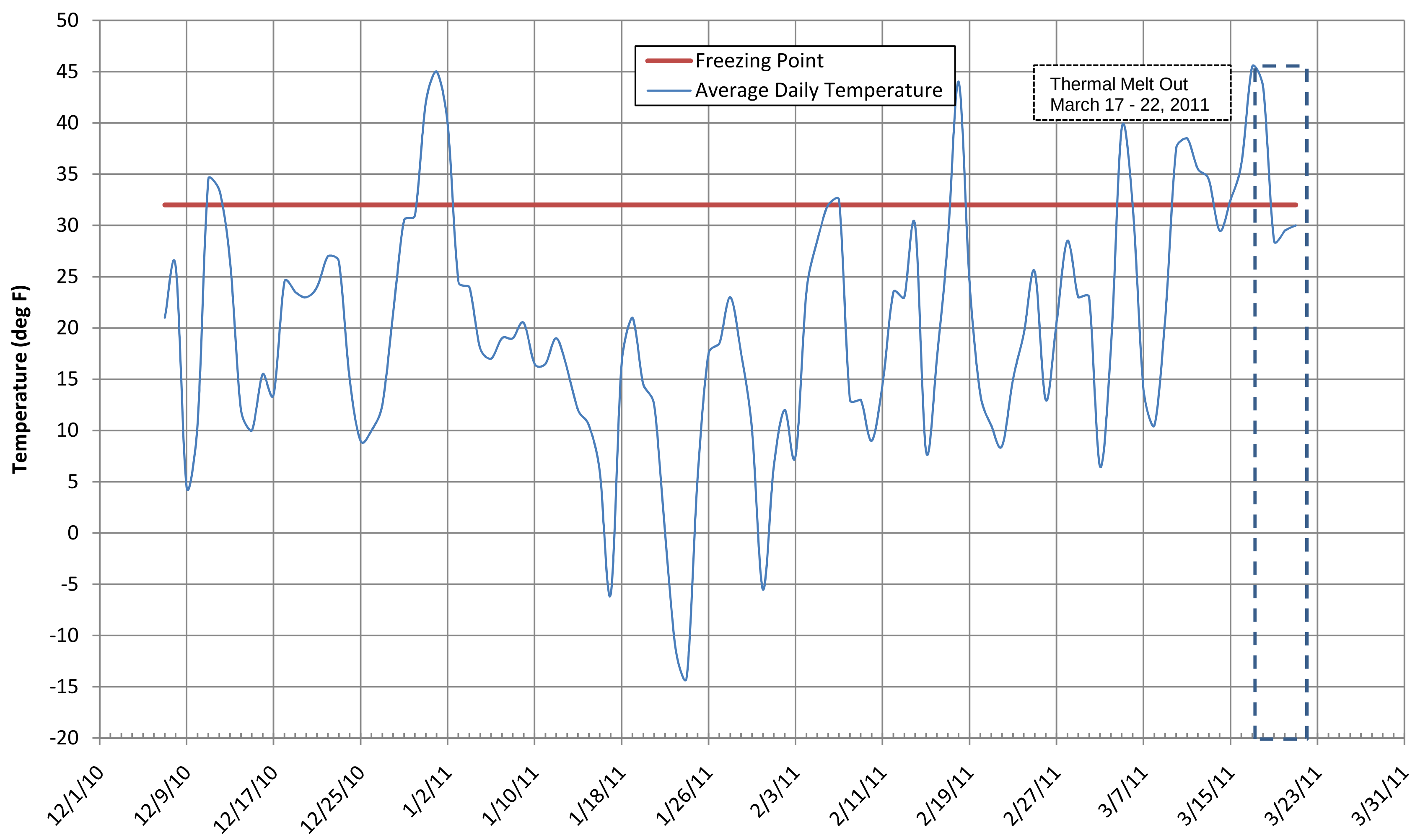
1. Water surface elevations obtained from USGS 7.5 minute series topographic quadrangles.

GRASSE RIVER STUDY AREA
MASSENA, NEW YORK

TYPICAL WATER SURFACE ELEVATION OF THE GRASSE RIVER

ALCOA

FIGURE
3-2



Note:
-Temperature data reported from Massena International Airport

Figure 3-3
Air Temperature for Winter 2010/2011
Massena, NY

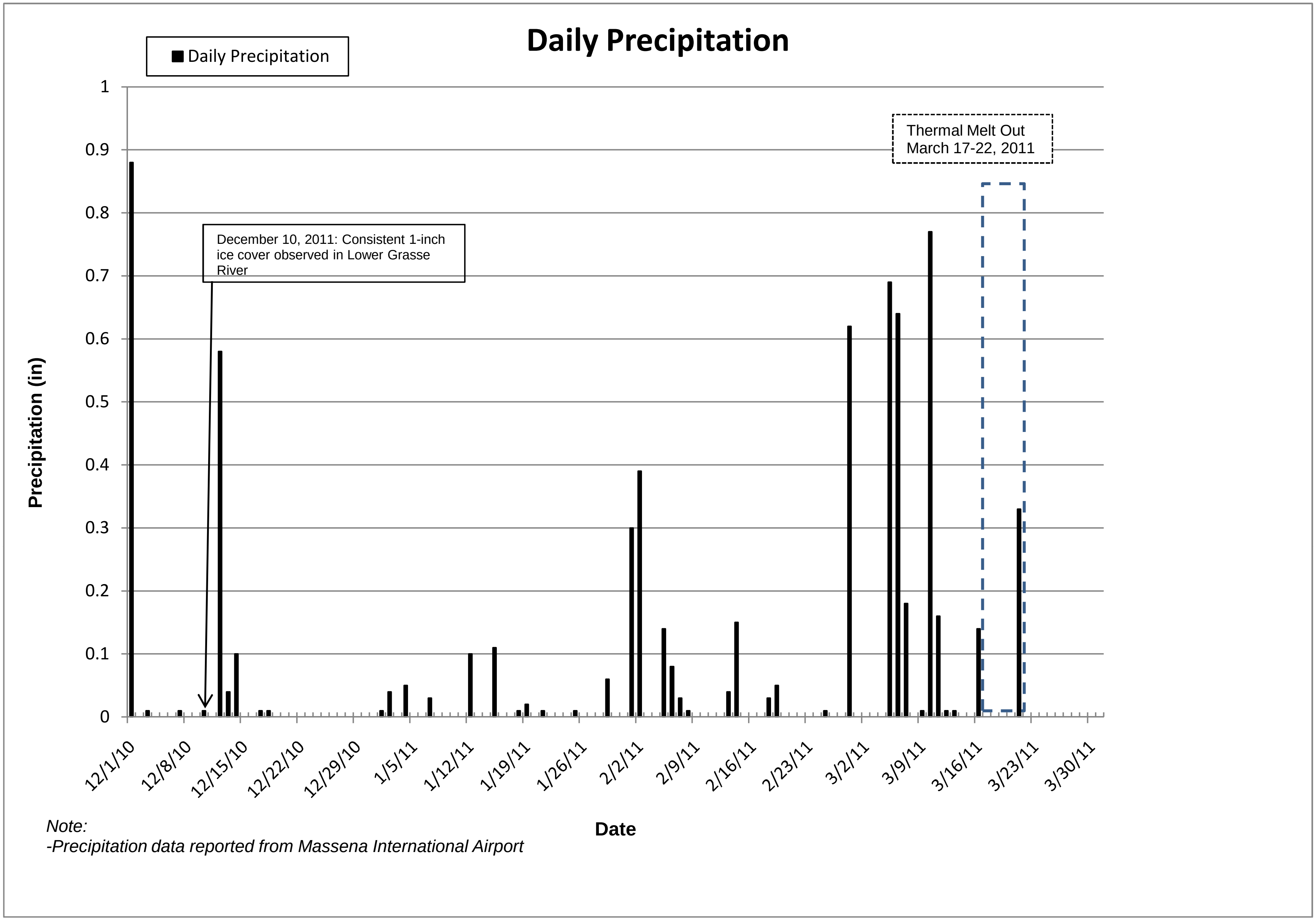


Figure 3-4
Precipitation Data for Winter 2010/2011
Massena, NY

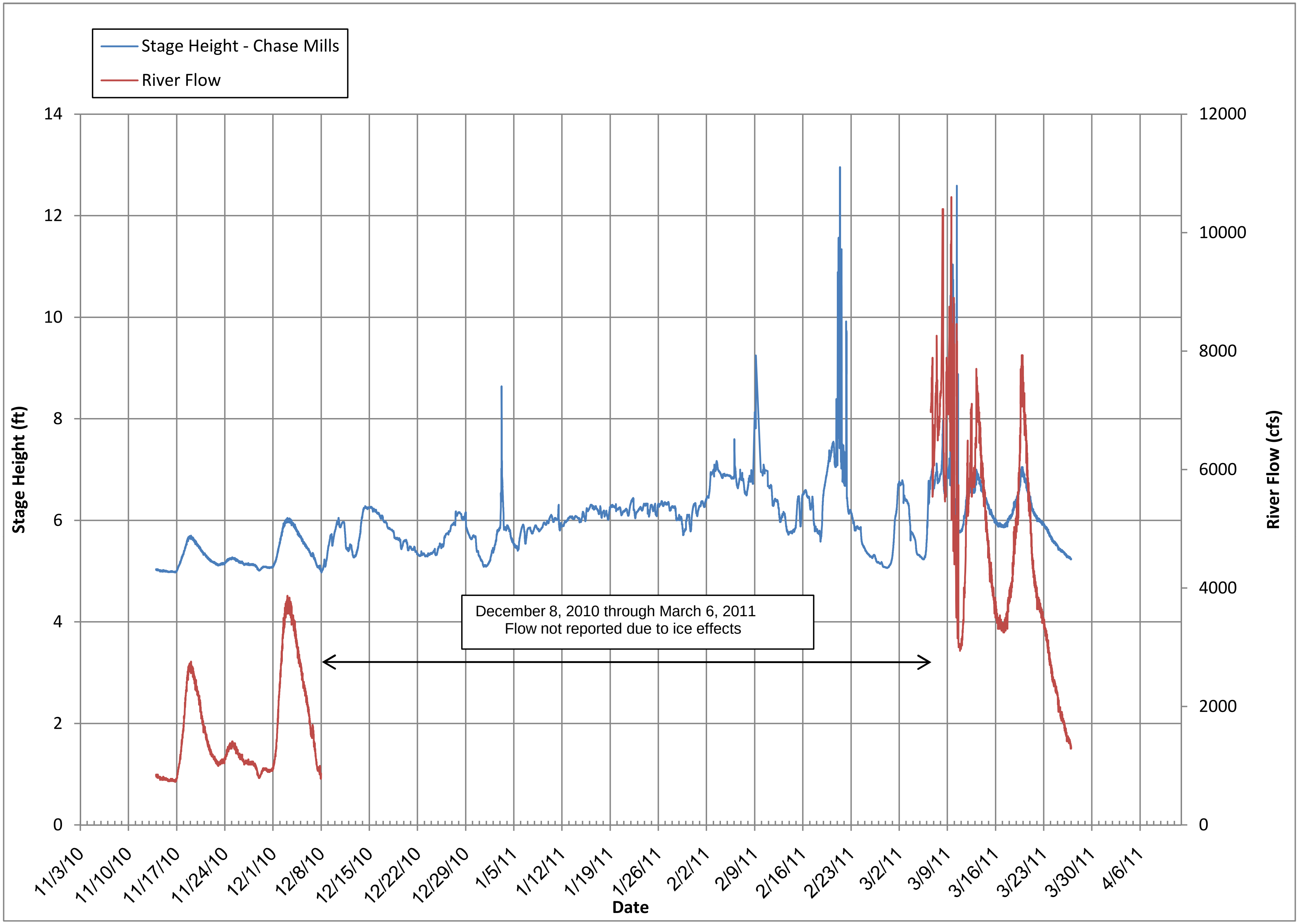


Figure 3-5a
Real Time Stage Height and Flow for Winter 2010/2011
Chase Mills, NY USGS Gaging Station

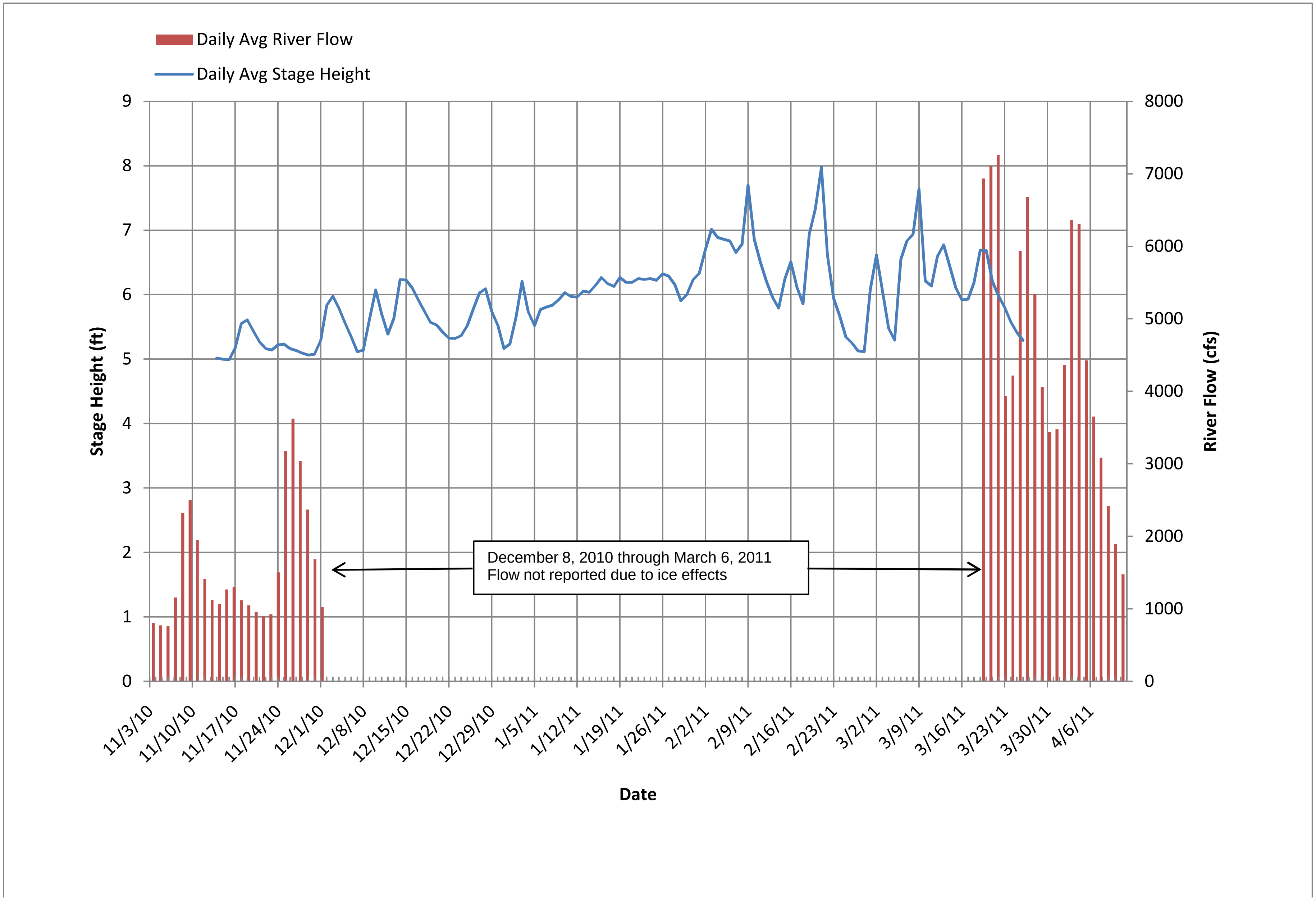


Figure 3-5b
Daily Average Stage Height and Flow for Winter 2010/2011
Chase Mills, New York USGS Gaging Station

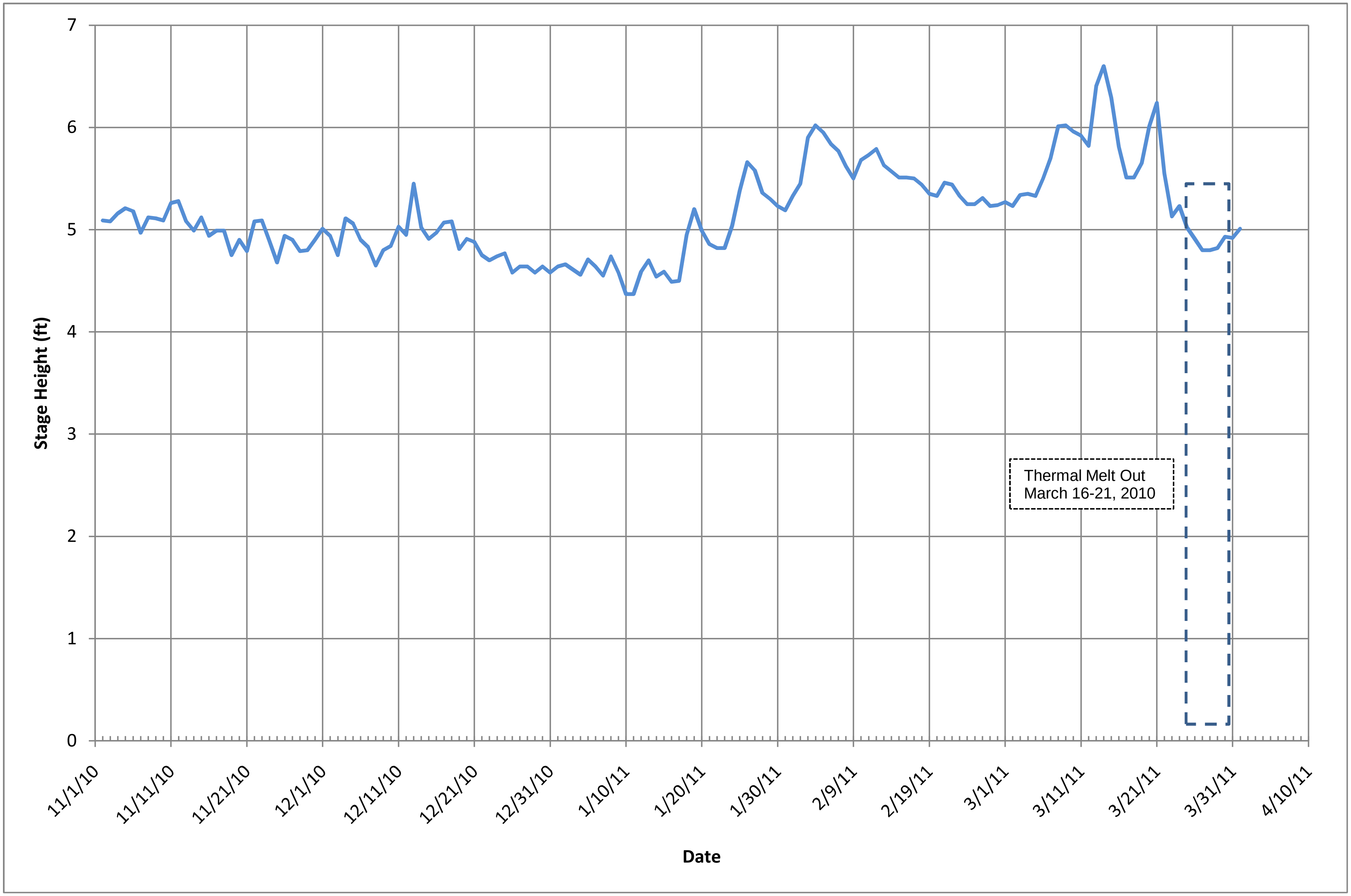
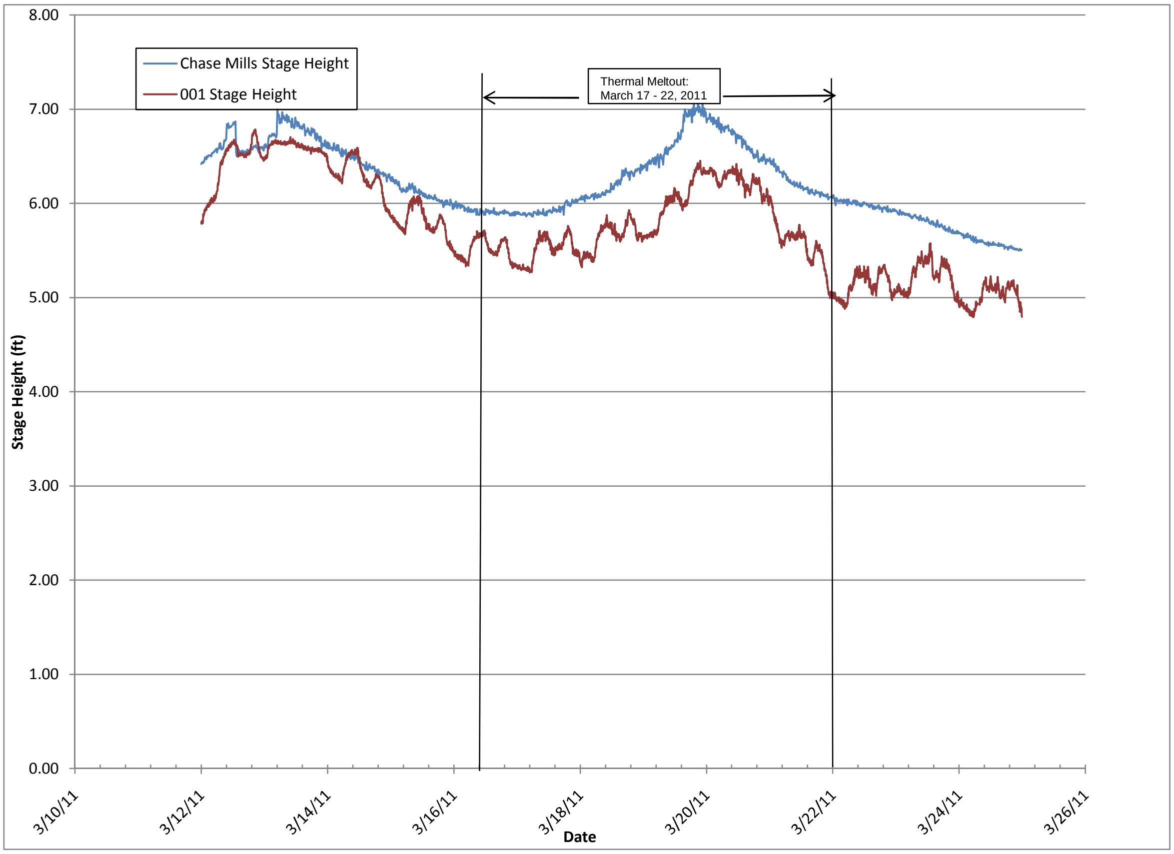


Figure 3-6
Daily Average Stage Height for Winter 2010/2011
Alcoa Outfall 001 Staff Gage
Massena, NY



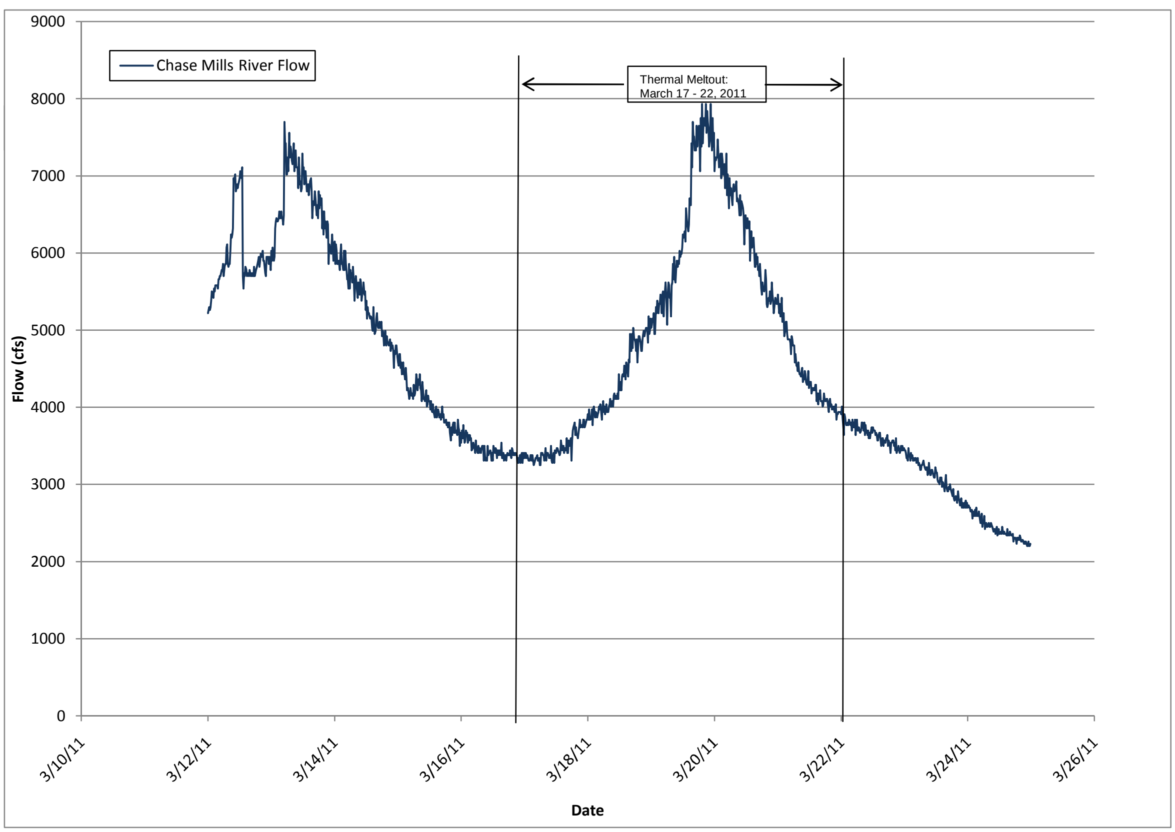
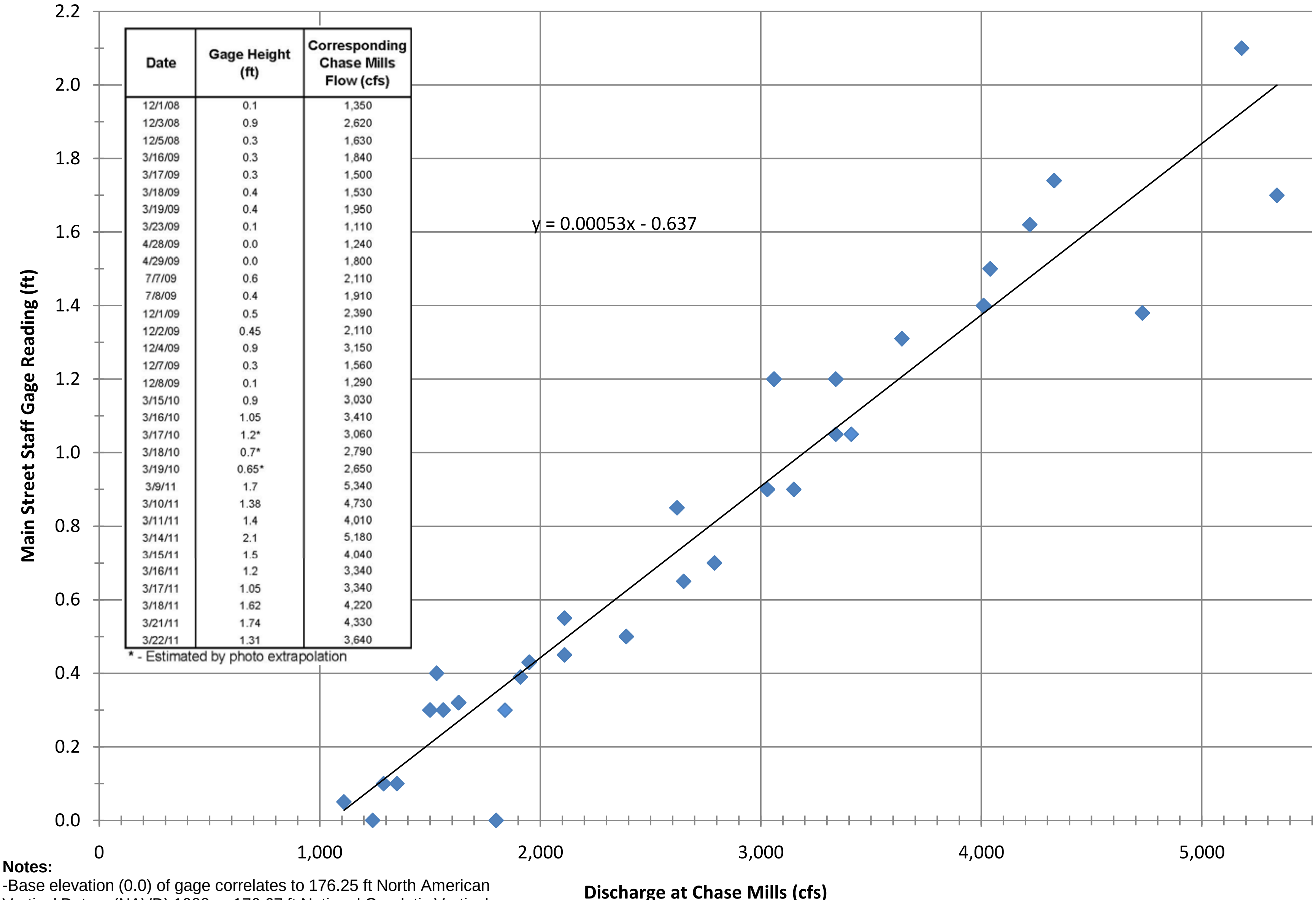


Figure 3-7
Real Time Stage Height and Flow for the Spring 2011 Ice Breakup
Chase Mills USGS Staff Gage and Outfall 001 Staff Gage



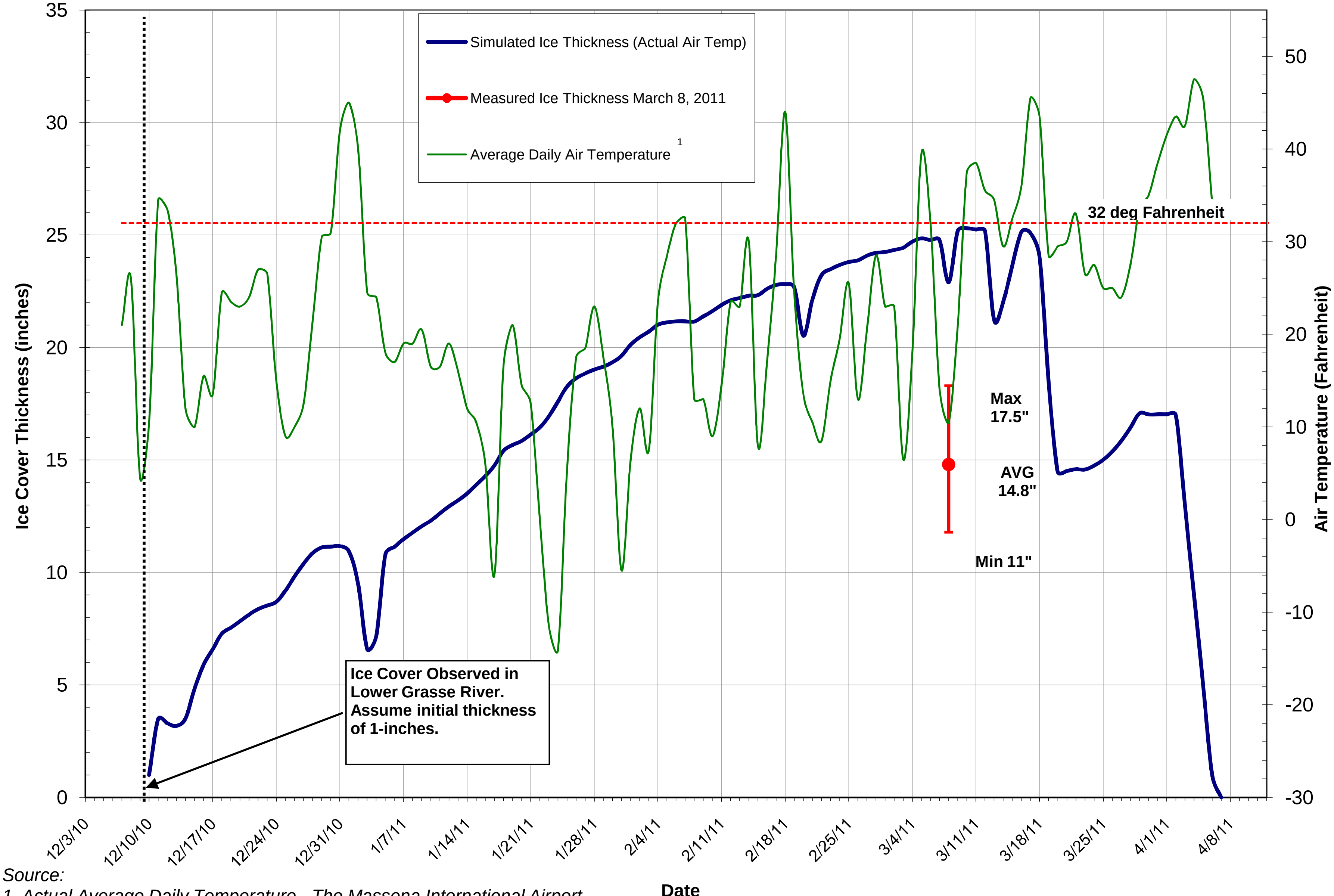
Date	Gage Height (ft)	Corresponding Chase Mills Flow (cfs)
12/1/08	0.1	1,350
12/3/08	0.9	2,620
12/5/08	0.3	1,630
3/16/09	0.3	1,840
3/17/09	0.3	1,500
3/18/09	0.4	1,530
3/19/09	0.4	1,950
3/23/09	0.1	1,110
4/28/09	0.0	1,240
4/29/09	0.0	1,800
7/7/09	0.6	2,110
7/8/09	0.4	1,910
12/1/09	0.5	2,390
12/2/09	0.45	2,110
12/4/09	0.9	3,150
12/7/09	0.3	1,560
12/8/09	0.1	1,290
3/15/10	0.9	3,030
3/16/10	1.05	3,410
3/17/10	1.2*	3,060
3/18/10	0.7*	2,790
3/19/10	0.65*	2,650
3/9/11	1.7	5,340
3/10/11	1.38	4,730
3/11/11	1.4	4,010
3/14/11	2.1	5,180
3/15/11	1.5	4,040
3/16/11	1.2	3,340
3/17/11	1.05	3,340
3/18/11	1.62	4,220
3/21/11	1.74	4,330
3/22/11	1.31	3,640

* - Estimated by photo extrapolation

Notes:
-Base elevation (0.0) of gage correlates to 176.25 ft North American Vertical Datum (NAVD) 1988 or 176.67 ft National Geodetic Vertical Dataum (NGVD) 1929

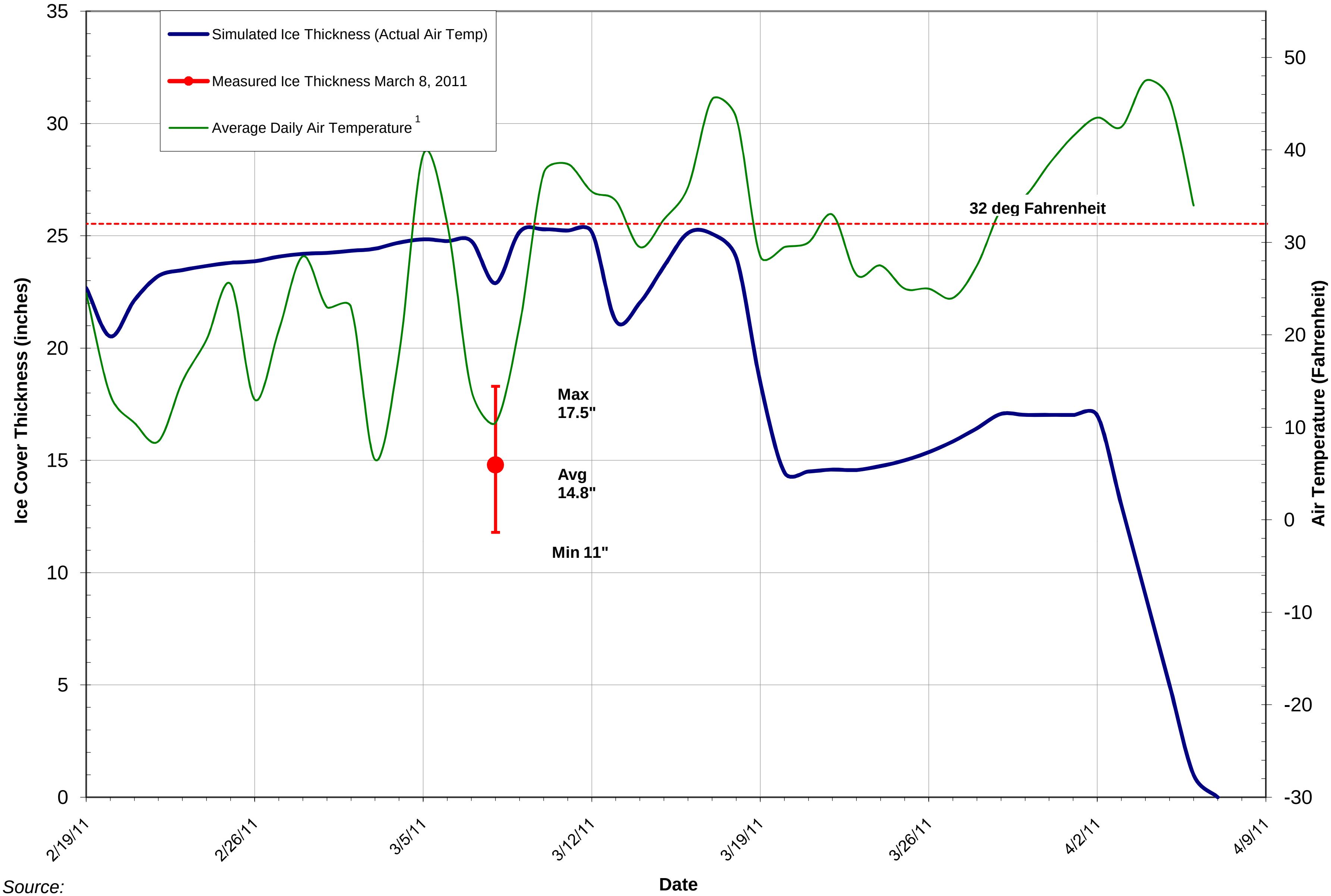
-Trend line created using the linear fit function in Microsoft Excel

Figure 3-8
Stage Height-Discharge Correlation Curve for Main Street Bridge Staff Gage



Source:
1. Actual Average Daily Temperature - The Massena International Airport

Figure 3-9
Lower Grasse River
Ice Thickness Forecasting Model
Simulated Results for Winter 2010/2011



Source:
1. Actual Average Daily Temperature - The Massena International Airport

Figure 3-10
Lower Grasse River Ice Thickness Forecasting Model
Simulated Results Through Breakup

Figure 3-11a: Shoreline deterioration upstream of Route 37 Bridge (March 17, Location 10)

Figure 3-11b: Accumulation of thin ice pieces upstream of Alcoa Bridge (March 17, Location 7)

Figure 3-11c: Continued deterioration of ice cover upstream of Route 37 Bridge (March 21, Location 10)

Figure 3-11
Lower Grasse River
Photographs During 2010/2011 Spring Breakup

Figure 3-11d: Open water downstream of Alcoa Bridge (March 21, Location 7)

Figure 3-11e: Deterioration downstream of Route 131 Bridge (March 21, Location 4)

Figure 3-11f: Deterioration upstream of Route 131 Bridge (March 21, Location 4)

Figure 3-11
Lower Grasse River
Photographs During 2010/2011 Spring Breakup

Figure 3-11g: Ice floes observed downstream of Capping Pilot Study Area (March 21, Location 5)

Figure 3-11h: Some remaining thin ice along south shore upstream of Haverstock Road (March 22, Location 2)

Location 3-11i: River free of ice downstream of Haverstock Road (March 22, Location 2)

Figure 3-11
Lower Grasse River
Photographs During 2010/2011 Spring Breakup

SECTION 4
QUALITY ASSURANCE/QUALITY CONTROL

4.1 INTRODUCTION

This section describes the quality control evaluation conducted for the water column and resident fish data collected from the lower Grasse River in 2010 as part of the SRS Program. Guidelines set forth in the *2008 Routine Monitoring Activities Correspondence* were supplemented, where appropriate, with those discussed in the Quality Assurance Project Plan (QAPP) developed for the Grasse River project (Blasland, Bouck & Lee, Inc. [BBL], September 1993). These guidelines were established to assess whether field, laboratory, and data management activities were performed in a manner that is appropriate for accomplishing the project objectives.

The procedures and metrics used in the QA/QC evaluation are presented in Section 4.2, while the results of the data evaluation are discussed in Section 4.3.

4.2 QA/QC PROCEDURES

The QA/QC procedures used to evaluate the data collected during 2010 consisted of several steps, including:

- review of the field chain-of-custody (COC) forms and data received from the laboratory for completeness;
- automation of data compilation, when possible, to minimize errors within the database; and
- review of the QA/QC data to assure that results of the quality control analyses are within the control limits developed for the project.

Upon receipt of the data, the field COC forms were reviewed and compared to the data received from the laboratory to ensure that sample identifications listed on the COC forms matched those reported in the data packages. This process was used to check that results were reported for all field and QA/QC samples (such as MS and MSD).

Following this review, the data were compiled and entered into an Excel database. All data from the laboratory were received electronically and appended, when possible, to the existing database using tools available in Microsoft Excel and Interactive Data Language (IDL). During the rare occasions when tools could not be used (i.e. data arrived in portable document format [PDF]), data were manually input into the databases.

After the data were incorporated into the project database, several metrics (as outlined in the QAPP) were evaluated to determine the quality of the water column and resident fish data. Data metrics used in this evaluation included:

- overall data completeness;
- method detection limits (MDL);
- number of QA/QC samples collected and analyzed;
- blank analysis;
- MS and MSD analyses; and
- field duplicate analysis.

Data were deemed acceptable if the following criteria were satisfied:

- Overall data completeness equaled or exceeded 90%. Overall data completeness was computed by dividing the number of valid data obtained by the total number of data planned for collection and analyses.
- MDLs from the QAPP for total PCBs quantified on an Aroclor basis in water and biota samples were about 0.065 micrograms per liter (µg/L) and 0.05 mg/kg, respectively. MDLs for total PCB congeners were not specified. The MDL for TSS in water was 1.0 mg/L.

- For the routine water column samples, a minimum of one equipment rinse blank was collected before and after sampling. In addition, at least one duplicate sample and one MS/MSD pair were collected each round.
- For resident fish samples, a minimum of one MS/MSD pair was prepared by the laboratory for every twenty submitted field samples.
- PCB levels in laboratory, equipment (rinse), and method blanks were near or below the detection limit.
- Percent recoveries for MS/MSD samples of water analyzed for total PCBs were between 70% and 130% (to evaluate accuracy).
- The relative percent difference between MS and MSD samples analyzed for total PCBs were less than 35% (to evaluate precision).
- Criteria for relative percent differences between field samples and their duplicates analyzed for total PCBs or TSS were not prescribed in the QAPP.

Results of the QA/QC evaluation are discussed in Section 4.3.

4.3 RESULTS OF QA/QC ANALYSES

This section presents the results of the QA/QC analyses performed on data collected in 2010. A discussion of the water column and resident fish data is provided below.

4.3.1 Water Column

This subsection reports the assessment of QA/QC data collected during the 2010 routine water monitoring program.

Completeness. Samples (one bottle for PCB analysis and one bottle for TSS analysis at each sampling transect) were collected as planned for all four transects during the 9 rounds of routine monitoring in 2010 in accordance with the *2008 Routine Monitoring Activities Correspondence* and procedures identified in the *2005 Monitoring Work Plan*. However, five bottles intended for PCB analysis arrived at the lab above the 4°C maximum required temperature. Three bottles (collected on April 29, 2010 at WC013 [0.2], WC013 [0.8] and WCMSB) targeted for Saturday delivery were delayed until Monday, resulting in a temperature in the cooler of 17.6°C. Two bottles (collected on July 21, 2010 at WC131 [0.2] and WC011 [0.2]) were in a sample cooler that was lost in transit to NEA. The cooler was eventually found by the transport service and delivered to NEA. At the time of delivery, the temperature in the cooler had reached 16.0°C. As a result, PCB analysis was not performed for these samples; however, TSS analysis was performed on samples from these locations/depths.

The result of one river sample collected on June 20, 2010 (WC013 [0.8]) suggests cross contamination in the laboratory. Congener patterns observed in these samples are similar to those of the spiked samples and do not resemble the congener pattern typically observed in the Grasse River. This sample has been excluded from analyses.

Method detection limit. Since a MDL was not prescribed for PCB congeners, the MDL for Aroclors was used for comparison. The lower bound estimate of the nominal MDL for routine monitoring water samples was about 27.8 ng/L for total PCBs (Alcoa, April 2002), below the QAPP requirement of 65 ng/L.

The MDL for TSS measured as part of routine monitoring met the requirement of 1.0 mg/L.

Number of QA/QC samples. The number of field duplicates and MS/MSD pairs collected during routine monitoring met the requirement of one per round (9). The number of rinse blanks collected met the requirement of 18. Additional QA/QC samples for PCBs included 9 laboratory blanks and 9 laboratory control spikes.

Two field duplicates (Round 1 and Round 5) were unable to be used for PCB analysis. The field duplicate collected during Round 1 was not used as its parent sample (WCMSB) arrived at the lab above 4°C. An additional field duplicate was collected during Round 2. The field duplicate collected during Round 5 was not used as both the field duplicate and its parent sample (WC-011 [0.2]) arrived about 4°C. An additional field duplicate was collected during Round 6.

The requirement of one field duplicate per sampling round for TSS analysis was fulfilled for routine monitoring.

Blanks. All laboratory and rinse blank concentrations were below the nominal detection limit.

Matrix spike and matrix spike duplicates. All MS/MSD samples were within the prescribed range for MS/MSD percent recovery and relative percent difference.

Field duplicates. The relative percent difference between the nine pairs of samples and their duplicates analyzed for total PCBs and for TSS ranged from 0.0% to 101% and 0.0% to 42%, respectively. Criteria for the relative percent differences between samples and their duplicates analyzed for total PCBs and for TSS were not defined in the QAPP.

4.3.2 Resident Fish

This subsection reports the assessment of QA/QC data collected during the resident fish monitoring program.

Completeness. All samples were collected as stated in the *2008 Routine Monitoring Activities Correspondence* and the procedures identified in the *2005 Monitoring Work Plan*. A total of 144 samples were submitted to the laboratory for PCB and lipid analysis. No samples were lost during shipment or analysis.

Method detection limit. Fifteen of the 144 samples submitted to the laboratory had PCB levels that were reported below the detection limit. All samples were analyzed at the 0.05 mg/kg wet weight MDL defined in the QAPP. It should be noted that samples were reported as non-detect by the laboratory if their concentrations were less than the practical quantitation limit (PQL).

Number of QA/QC samples. Six MS/MSD pairs were extracted, analyzed, and reported by the laboratory, which does not meet the requirement of seven pairs. In addition, thirteen method blanks and thirteen laboratory control spikes (twelve for PCBs, thirteen for lipids) were included for analysis.

Blanks. All method blanks contained non-detectable PCB levels.

Matrix spike and matrix spike duplicates. All MS/MSD sample pairs had relative percent differences within prescribed limits.

Field duplicates. The collection of field duplicates was not performed as part of the resident fish sampling program.

4.4 SUMMARY

Overall, the quality of the data for water column and resident fish samples collected during 2010 met the guidelines established for the project. On the infrequent occasions when guidelines were not met, the affected samples are identified in the database. With the exception of these samples, all other data were deemed appropriate for use in performing qualitative and quantitative evaluations required to satisfy the project objectives.

SECTION 5
REFERENCES

Alcoa, Inc (Alcoa), March 2011. *Near Shore Sampling Program Report.*

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Alcoa, April 2001. *Comprehensive Characterization of the Lower Grasse River.*

BBL, September 1993. *River and Sediment Investigation (RSI) Phase II Site Operations Plan*, Grasse River Site, Massena, New York.

Appendix A

This appendix contains the Grasse River Environmental Database in two formats: Microsoft Access and text files formatted for EquIS. This database is provided electronically on the enclosed CD. A data dictionary is also included to facilitate use of the database.

Appendix A: Section 1 – Data Dictionary for SRS Environmental Database

Appendix A: Section 2 – Data Dictionary for ROPS Environmental Database

Appendix B

Spring 2011 Ice Monitoring Photos and Aerial Inspection

ALCOA